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MONTANA
1984 NETWORK REVIEW

compiled by

Jim Olsen

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1984 NETWORK REVIEW

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) requires the Montana Department of Health and Environmental Sciences, Air Quality Bureau (AQB) to conduct an annual review of the state's ambient air monitoring network. This report is the sixth in the series. EPA's requirements, as set forth in 40 CFR 58.20, are (1) to determine if the system meets the monitoring objectives defined in Appendix B of 40 CFR 58.20, and (2) to identify needed modifications of the network, such as termination or relocation of unnecessary stations or establishment of new stations that may be necessary. 40 CFR 58.25 requires the Bureau to develop and to implement an annual schedule to modify the network in order to eliminate any unnecessary stations or to correct any inadequacies indicated by the results of the annual review. The Bureau must consult with the Regional Administrator of the EPA during the development of the schedule to modify the monitoring program. The final schedule and modifications are subject to the approval of the Regional Administrator.

In order to conduct this review, the monitoring objective and spatial scale of representativeness of each station, existing or proposed, are first examined to determine whether they represent the area's air quality situation. Background information, such as maps, climatological summaries, emission inventories, traffic counts, and modeling results, are gathered and reviewed. The opinions of the Bureau staff, the personnel of three county air pollution agencies as well as several other county health agencies, and staff members of the Helena EPA office also are solicited.

In the 1979 Network Review, the AQB designated each monitoring site in the State as either National Air Monitoring Stations (NAMS), State and Local Air Monitoring Stations (SLAMS), or Special Purpose Monitoring Stations (SPM). The NAMS/SLAMS network is designed to meet four basic monitoring objectives: (1) to determine the highest concentrations expected to occur in the area covered by the network (concentration); (2) to determine representative concentrations in areas of high population density (population); (3) to determine the impact on ambient pollution levels of significant sources or source categories (source); and (4) to determine general background concentration levels (background). Each station in the NAMS/SLAMS network also is sited so that the air sampled is representative of certain spatial scales, which are defined as follows:

Microscale: defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

Middle Scale: defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.

Neighborhood Scale: defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.

Urban Scale: defines the overall city-wide conditions with dimensions on the order of four to 50 kilometers. This scale usually would require more than one site for definition.

Regional Scale: usually defines a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.

National and Global Scales: these measurement scales represent concentrations characterizing the nation and the globe as a whole.

In order to site a monitoring station properly, both the monitoring objective and the spatial scale of representativeness must be determined. Appropriate siting scales for the various monitoring objectives are listed in Table 1.

TABLE 1

MONITORING OBJECTIVES AND APPROPRIATE SITING SCALES

<u>Monitoring Objective</u>	<u>Siting Scales</u>
Highest concentration	Micro, middle, neighborhood (sometimes urban)
Population	Neighborhood, urban
Source impact	Micro, middle, neighborhood
Background	Neighborhood, regional

The goal in siting stations is to match correctly the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for each station's monitoring objective. During the process of the first network review in 1979, existing stations were evaluated for their monitoring objective and siting scale and, if necessary, the stations were modified. New stations established since then have been sited in accordance with the monitoring objective and siting scale determined in advance.

The AQB developed this network review as a supplement to the comprehensive 1983 Network Review. The Bureau intends to perform a more thorough review in 1985.

TOTAL SUSPENDED PARTICULATES (TSP)

TSP is the most ubiquitous pollutant in Montana, affecting the entire state. Major sources of particulates include: industrial activity, coal mines, unpaved roads, agricultural activity and residential wood burning. The highest particulate concentrations in Montana are found in urban areas such as Billings, Butte, Kalispell, and Missoula, or smaller towns in western Montana such as Libby and Thompson Falls. Particularly in the western valleys, winter inversions allow particulate levels to increase and to remain high for days or weeks at a time. Some rural areas also show high particulate levels, due not only to agricultural activities and unpaved roads, but also to coal mines and other industrial sources.

All of Montana's TSP monitors are sited according to the neighborhood, urban or regional scale (see Table 1). Selection of the appropriate siting scale is dependent on the station's monitoring objective. The monitoring objective for most stations is "population". In most cases, these "population" stations are sited according to the "neighborhood" scale, which corresponds to areas with dimensions from 0.5 to 4.0 kilometers.

For those stations designed to determine the impact of particulate sources on ambient particulate concentrations, the monitoring objective is "source". Most of the particulate monitoring around air pollution sources is conducted by the companies responsible for the emissions. The Bureau receives data from company sites and conducts periodic audits of the sites and data. All "source" stations are sited according to the "neighborhood" scale with the exception of the Scobey Border Station, which is scaled regionally.

Several stations in urban areas are designed to monitor areas of highest concentration, and are sited according to the "neighborhood" scale.

"Background" stations are chosen to determine concentrations of particulates in areas remote from man-made sources. The Bureau considers that a minimum of two background stations are required in Montana, one in the eastern part of the state to characterize background concentrations in the plains, and another in a western valley for the mountainous portion of the state. Ovando, in Powell County, serves as the western Montana background station while Jordan in Garfield County comprised the eastern Montana station until May 1984, when the operator could not find time to operate it. The AQB removed the site at Jordan, anticipating moving it to Winnett, Montana. All three background sites were or will be sited according to the "regional" scale.

Appendix A of 40 CFR 58 requires that at least two stations in the network be selected for duplicate sampling and that two samplers be co-located at these sites. Sites with the highest expected geometric mean concentrations must be chosen. The Bureau started collocated TSP sampling at the Lincoln County Courthouse in Libby in August, 1984. This site will replace the Greeley School collocated site because of its higher geometric mean. The Greeley School collocated sampler will terminate December 30, 1984. Table 2 lists stations where the Bureau and the county agencies have collocated samplers.

TABLE 2
COLLOCATED HIGH VOLUME SAMPLERS

<u>City</u>	<u>Site</u>
Billings	Taft School (NAMS)
Billings (County)	City Hall (SLAMS)
Butte*	Greeley School (SLAMS)*
Great Falls (County)	Downtown (NAMS)
Missoula (County)	Boyd Park (SLAMS)
Missoula	HW#1 (SPN)
East Helena	Hadfield (SLAMS)
Libby	Lincoln Co. Courthouse (SLAMS)

*Will be terminated December 30, 1984.

Montana's network of NAMS stations for TSP consists of two stations selected from the SLAMS network. NAMS are required in urban areas larger than 50,000 population. In Montana only Great Falls and Billings have Standard Metropolitan Statistical Areas with populations in excess of 50,000. The TSP NAMS criteria are given in Table 3. Based on these criteria, both Billings and Great Falls fall into the "medium" concentration range and thus require one to two NAMS stations each. The Bureau has established a NAMS station at Taft School in Billings and the Cascade County Air Pollution Control Agency has established one at the public library in downtown Great Falls. Missoula does not have a metropolitan statistical area of 50,000 population; however, the urbanized area does have over 60,000 residents. In light of this fact and since Missoula falls into the high concentration category, the AQB recommends that two NAMS sites be established. The Missoula Boyd Park and Courthouse Roof were chosen for NAMS sites because of their high readings and representative locations. The monitoring objectives of both these stations are "highest concentration" and "population", and all are sited according to the "neighborhood" scale of representativeness.

TABLE 3
TSP NATIONAL AIR MONITORING STATION CRITERIA*

Population Category	Concentration		
	<u>High</u>	<u>Medium</u>	<u>Low</u>
High Population over 500,000	6-8	4-6	0-2
Medium Population 100,000-500,000	4-6	2-4	0-2
Low Population 50,000-100,000	2-4	1-2	0

*Approximate number of stations per area

High concentration - exceeding level of the primary NAAQS by 20 percent or more.

Medium concentration - exceeding secondary NAAQS

Low concentration - less than secondary NAAQS

The AQB did not perform any statistical analysis to compare TSP data from different sites similar to that conducted during the 1983 Network Review. It is the Bureau's contention that the results would be very similar and the time and effort not warranted on a yearly basis. It is the AQB's intention to perform such analyses in conjunction with the 1985 Network Review and each odd year thereafter.

It should be noted that the recommendations for maintaining or terminating a station must be based on a number of criteria including projected growth in the area of the sampling site, the pollutant concentrations at the site (especially if they equal or exceed the standards) and funding. Table 11 prioritizes the proposed network modifications, so that fiscal restraints can be considered during the implementation phase.

Billings

1. A summary of 1983 TSP data for the Billings area is included in Table 5.
2. Billings area TSP levels were essentially the same in 1983 as in 1982. The City Hall and Grand Avenue sites registered annual geometric means which were seven and nine percent lower, respectively. At Taft School the geometric mean for TSP was slightly higher (4%). The Lockwood School site was terminated in 1982 and the high volume sampler was moved to Lockwood Park. However, the new site has not run long enough to obtain a representative year. The Sandstone School monitor has only run since late 1982 and there is not enough data to make a comparison.
3. The AQB is confident that the detailed analysis contained in the 1983 Network Review is still applicable and, therefore, is recommending no modifications to the Billings particulate network.
4. The AQB recommends the continued operation of samplers at Grand Avenue, City Hall, and Taft School. These locations register the highest concentrations in Billings and are essential to track the effectiveness of the non-attainment area control strategies. The Lockwood Park and Sandstone School sites will be continued until a good data base is established.

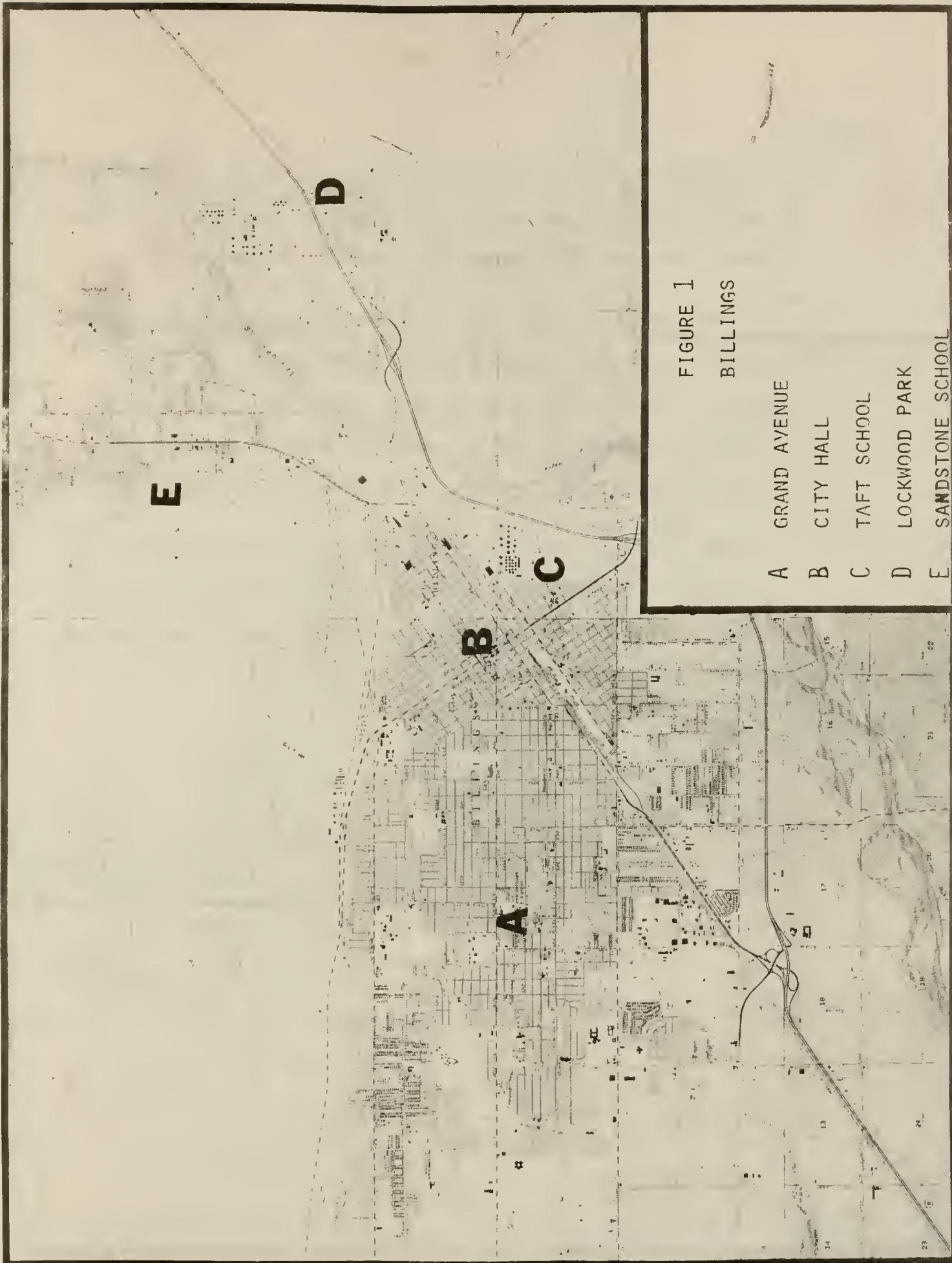


FIGURE 1
BILLINGS

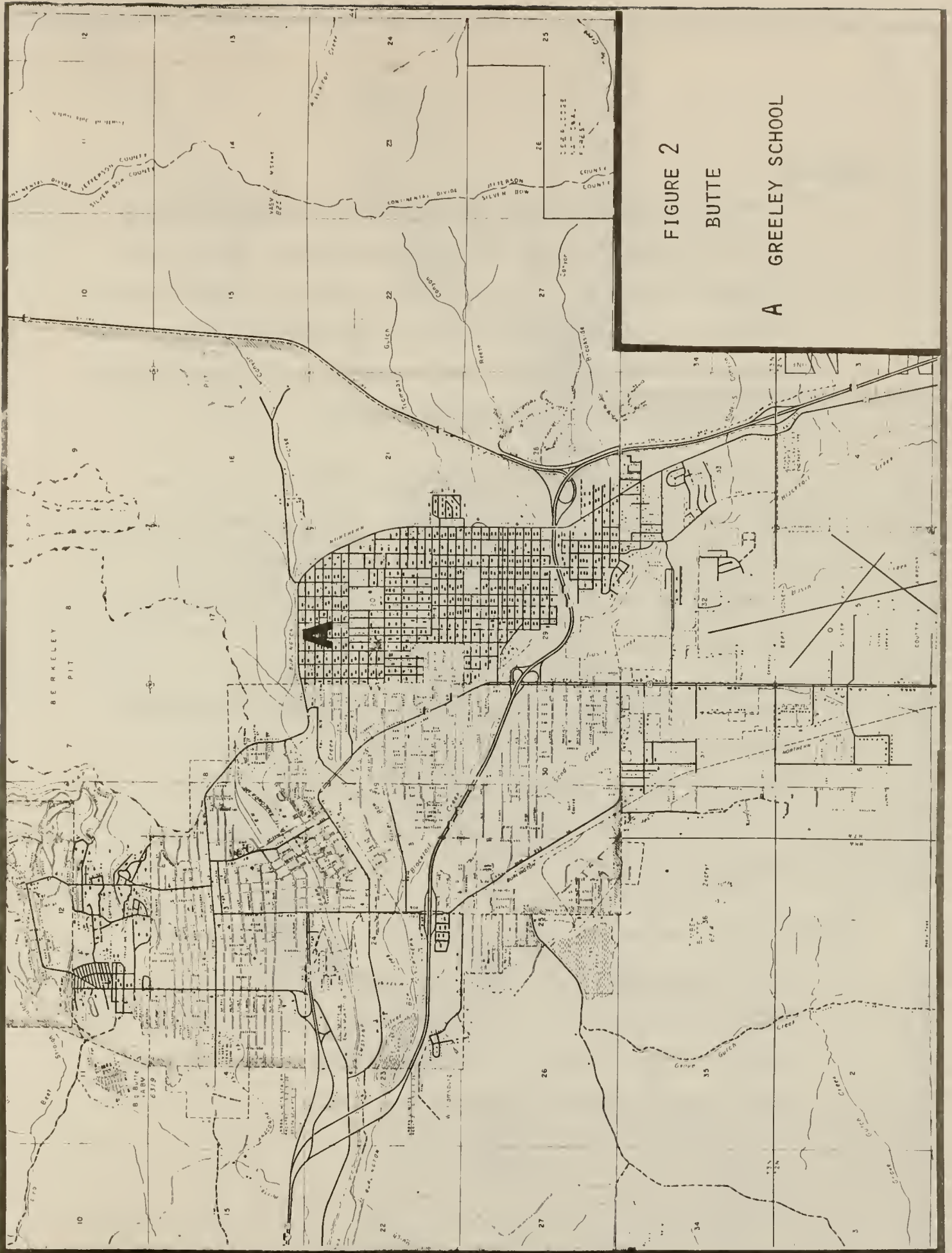
- A GRAND AVENUE
- B CITY HALL
- C TAFT SCHOOL
- D LOCKWOOD PARK
- E SANDSTONE SCHOOL

Butte

1. Dr. Canty and Hebgen Park sites were shut down in the summer of 1983. The only site that was operated for a complete year was the Greeley School site. Butte TSP levels are summarized in Table 5.
2. The Berkeley pit has been shut down since 1981 and the TSP levels at Greeley School have decreased steadily since then. The annual geometric mean of 50.0 ug/m^3 for 1983 is the lowest in 8 years of monitoring. The winter months still show high TSP probably due to the increased levels of residential wood burning (see Table 4).
3. The AQB will terminate the collocated sampler at Greeley School but will maintain the site to monitor toxic waste cleanup in the Butte area. The AQB will probably start monitoring inhalable particulates with PM-10 equipment in early 1985.

TABLE 4
TOTAL SUSPENDED PARTICULATES AT GREELEY SCHOOL
Monthly Mean

	<u>1983</u>	<u>1982</u>	<u>1981</u>	<u>1980</u>	<u>1979</u>
NOV	59	82	103	135	197
DEC	84	120	147	123	95
JAN	94	88	197	157	109
FEB	194	181	101	71	84



Great Falls

1. In 1983 the high volume samplers in Great Falls showed a decrease in the TSP geometric means over the previous year. The Fire Station site showed a 26% decrease in TSP in 1983 from that of the previous year. The Downtown site showed a 14% decrease during the same period. The AQB and Cascade County recommend the continued operation of both the Downtown site and the Fire Station.
2. The Franklin School site was started up in 1983 and run for one year. The geometric mean was 43 ug/m^3 . In light of the low readings, TSP monitoring at the Franklin School site was terminated at the end of the year. Table 5 summarizes all TSP data from Great Falls.
3. Due to increased construction on the southeast side of Great Falls and a lack of TSP information from that area, the Cascade City-County Health Department and State AQB recommend the siting of an additional high volume sampler for a few years to gather TSP data in that area.
4. The AQB recommends the continued operation of the Black Eagle high volume sampler because it has averaged 64 and 55 ug/m^3 geometric means for the last two years. These levels are near the federal secondary standard of 60 ug/m^3 and Cascade County wants to maintain the site for trend analysis.

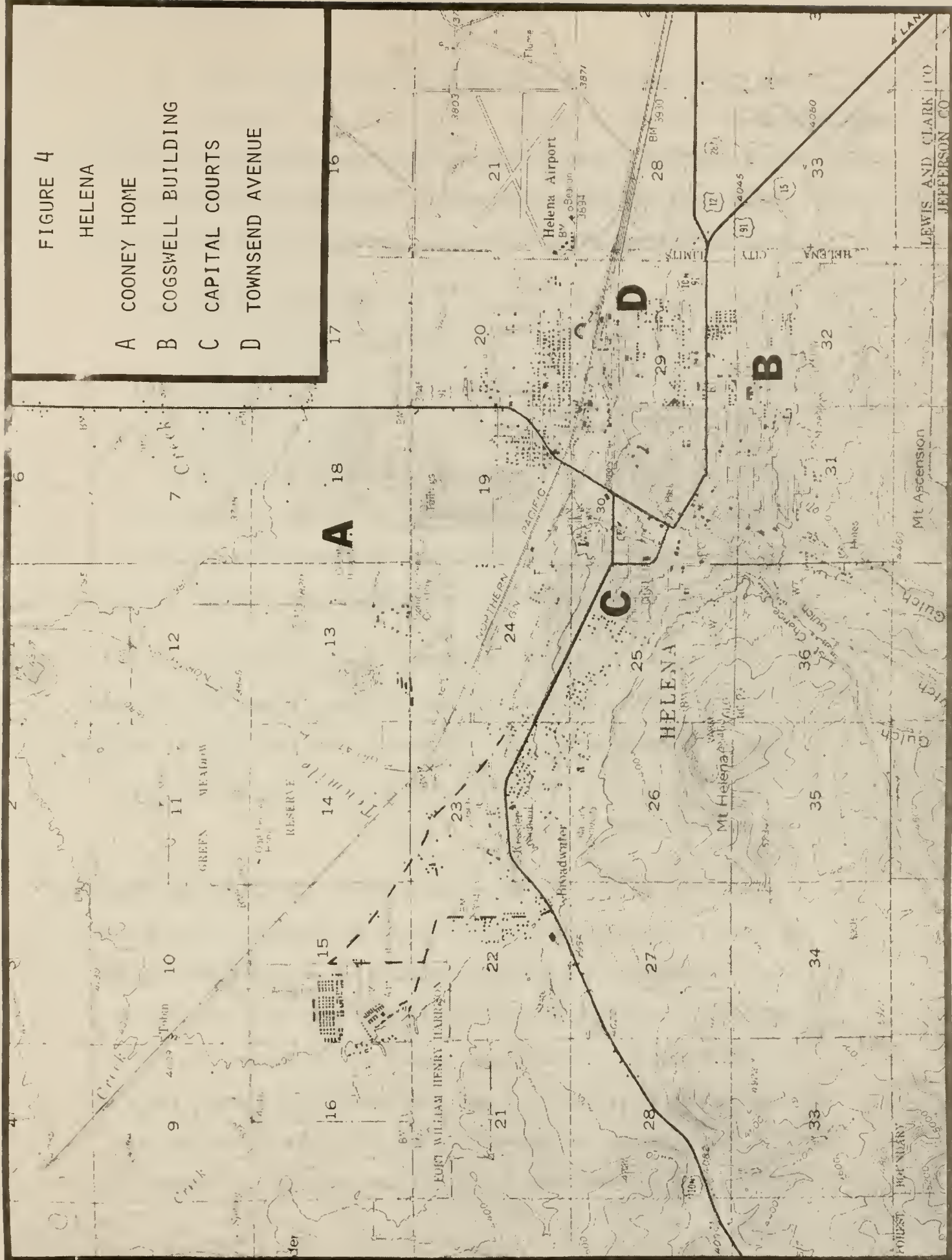
Helena

1. Capital Courts, the Cooney Convalescent Home and the Cogswell building are the locations of the three high volume samplers that ran in Helena during 1982-1983. An additional high volume sampler ran at Townsend Avenue during the summer and fall of 1983. The sampler was run as a part of the East Helena Health Study which was performed by the Montana Department of Health and the Centers for Disease Control (CDC) from Atlanta, Georgia. The Townsend Avenue sampler was shut down after the East Helena sampling came to a close in the fall of 1983.
2. The AQB recommends no modifications to the existing Helena high-volume sampler network.

FIGURE 4

HELENA

- A COONEY HOME
- B COGSWELL BUILDING
- C CAPITAL COURTS
- D TOWNSEND AVENUE



East Helena

1. East Helena is a small community about five miles east of Helena and is the site of the ASARCO lead smelter. East Helena has recently experienced residential growth along its southern and eastern edges.
2. Table 5 shows the TSP data summary for East Helena in 1982 and 1983. In 1983, the AQB ran two additional samplers: The Schneider residence and Dudley Street. The two sites were only run during the East Helena lead study. ASARCO has taken over the Hastie and Hadfield sites and have re-established the old AQB Firehall site to help determine compliance to the lead standard. The AQB is still operating the Dartman and South sites as part of the ongoing cooperative monitoring agreement with ASARCO.
3. The AQB intends to operate the Dartman, Hastie, Hadfield and South sites indefinitely as SLAMS stations to track TSP and lead concentrations. If ASARCO terminates the Firehall site, the AQB will continue to operate a site at this location as it is critical to the East Helena Lead SIP.
4. During 1980 and 1981 the AQB received several complaints from residents of Montana City concerning air pollution in the area. Since Montana City is located near the Kaiser Cement plant and the ASARCO smelter and the area is experiencing rapid growth with associated air pollution, the AQB installed a high volume sampler at the Montana City School. Sampling was conducted for a short period during February, March and April of 1981, but was temporarily stopped, since the sampler was needed in another location in conjunction with the East Helena lead

study. However, TSP concentrations were higher than expected, with a geometric mean of 73 ug/m^3 . Therefore, the AQB reopened this site during February of 1982 and has operated it for a year and a half. The geometric mean for 1982 and 1983 are 73 and 67 ug/m^3 , respectively. The AQB believes the majority of high readings come from dusty roads in the area and some residential wood burning. The high volume sampler will be operated until the end of December 1985 to assure a complete year of data. If, at that time, readings exceed the primary TSP standard, the AQB will perform a source investigation and recommend control strategies.

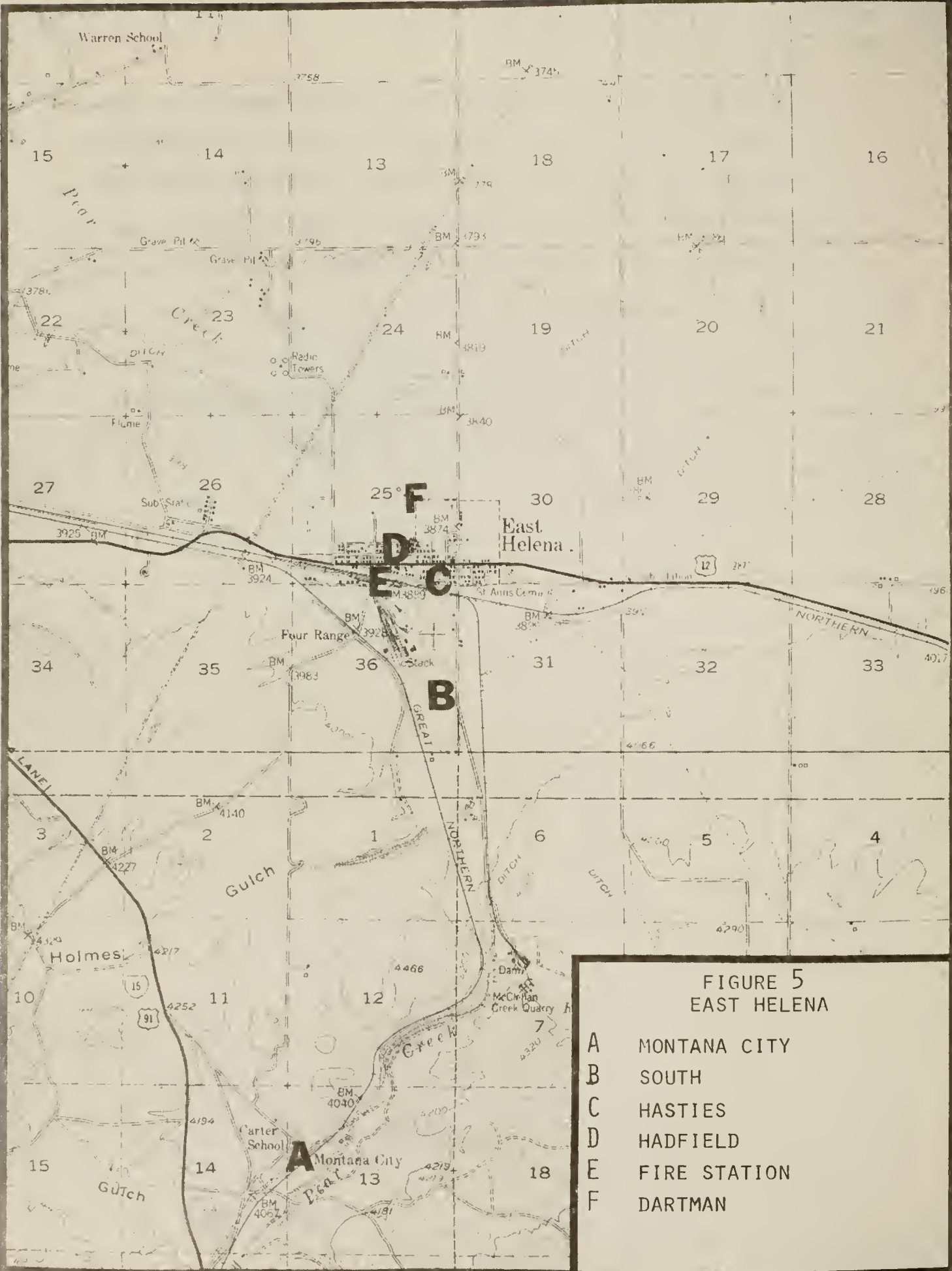


FIGURE 5
EAST HELENA

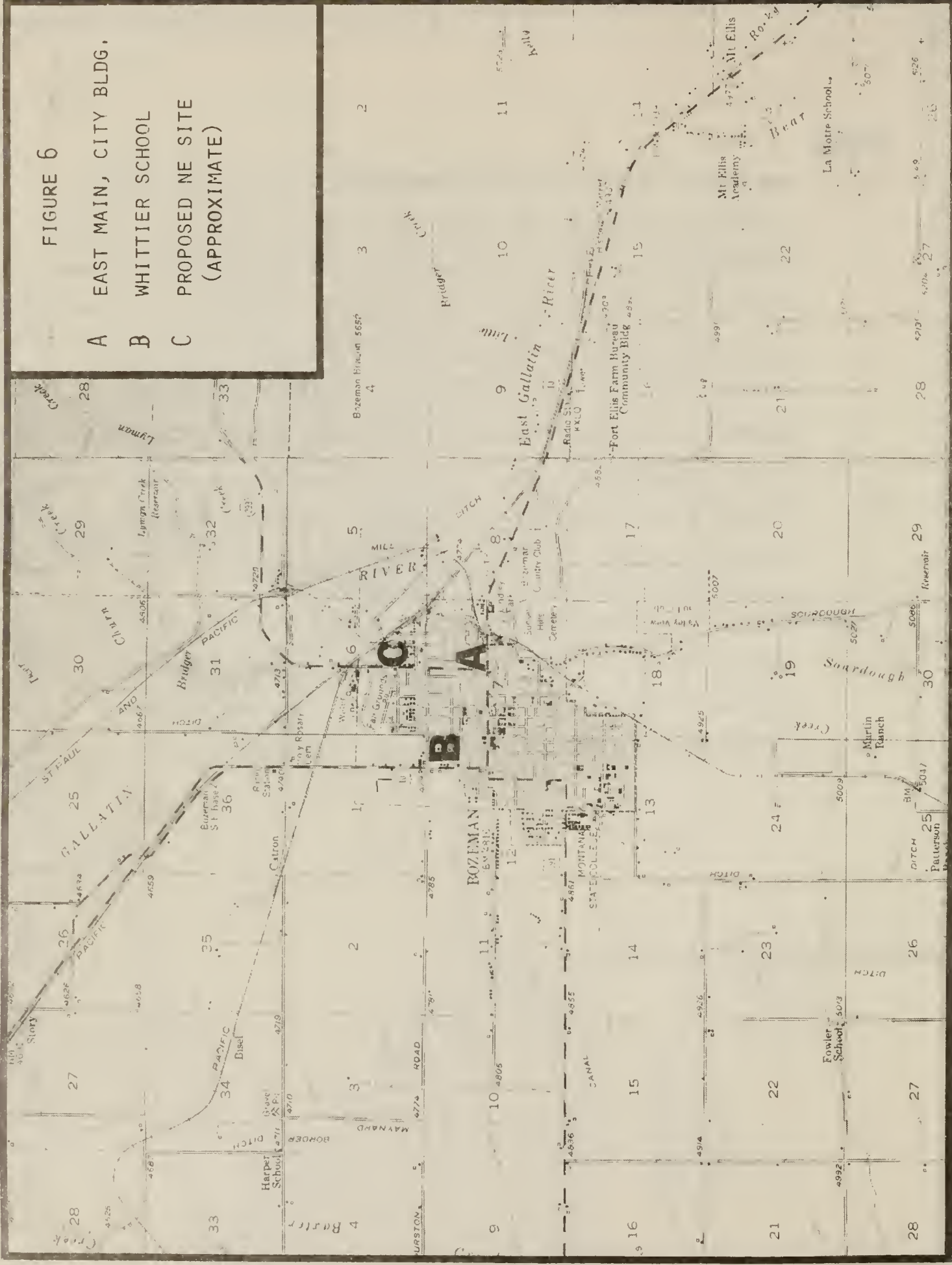
A MONTANA CITY
B SOUTH
C HASTIES
D HADFIELD
E FIRE STATION
F DARTMAN

Bozeman

1. The East Main site is the primary monitoring location in the Bozeman particulate network and AQB intends to continue to operate it. Table 5 summarizes the data from the Bozeman high volume sampler sites. The Whittier School site was instituted in 1982 and the AQB has monitored for two years at that location. The site was originally chosen to observe residential wood burning impact. The AQB recommends termination of the Whittier School site due to the fact that the site only showed a geometric mean of 47 for two years in a row and so far in 1984 the site has shown no substantial increase. It will be terminated December 31, 1984.
2. The AQB intends to monitor ambient air in the northeastern section of Bozeman. There are reports of unpaved roads causing fugitive dust problems in that area of Bozeman. The high volume sampler will be located in the general area outlined on the map (Figure 6).

FIGURE 6

- A EAST MAIN, CITY BLDG.
- B WHITTIER SCHOOL
- C PROPOSED NE SITE (APPROXIMATE)



Anaconda

1. The AQB has continued to operate the Lincoln School site in the east part of Anaconda despite the fact that the geometric mean was quite low during 1983, registering 36 ug/m^3 . This network also includes three additional sites in the vicinity of Mill Creek, Johnson's Curve and Highway Junction. The AQB is operating the high volume sampler at the old Highway Junction site and Anaconda Minerals is operating the Mill Creek and Johnson's Curve sites. The AQB intends to operate both the Lincoln School and Highway Junction sites until the Anaconda smelter complex cleanup is complete. The sites will be used to track particulates and their elemental constituents during demolition of the Anaconda smelter complex and subsequent cleanup.

FIGURE 7

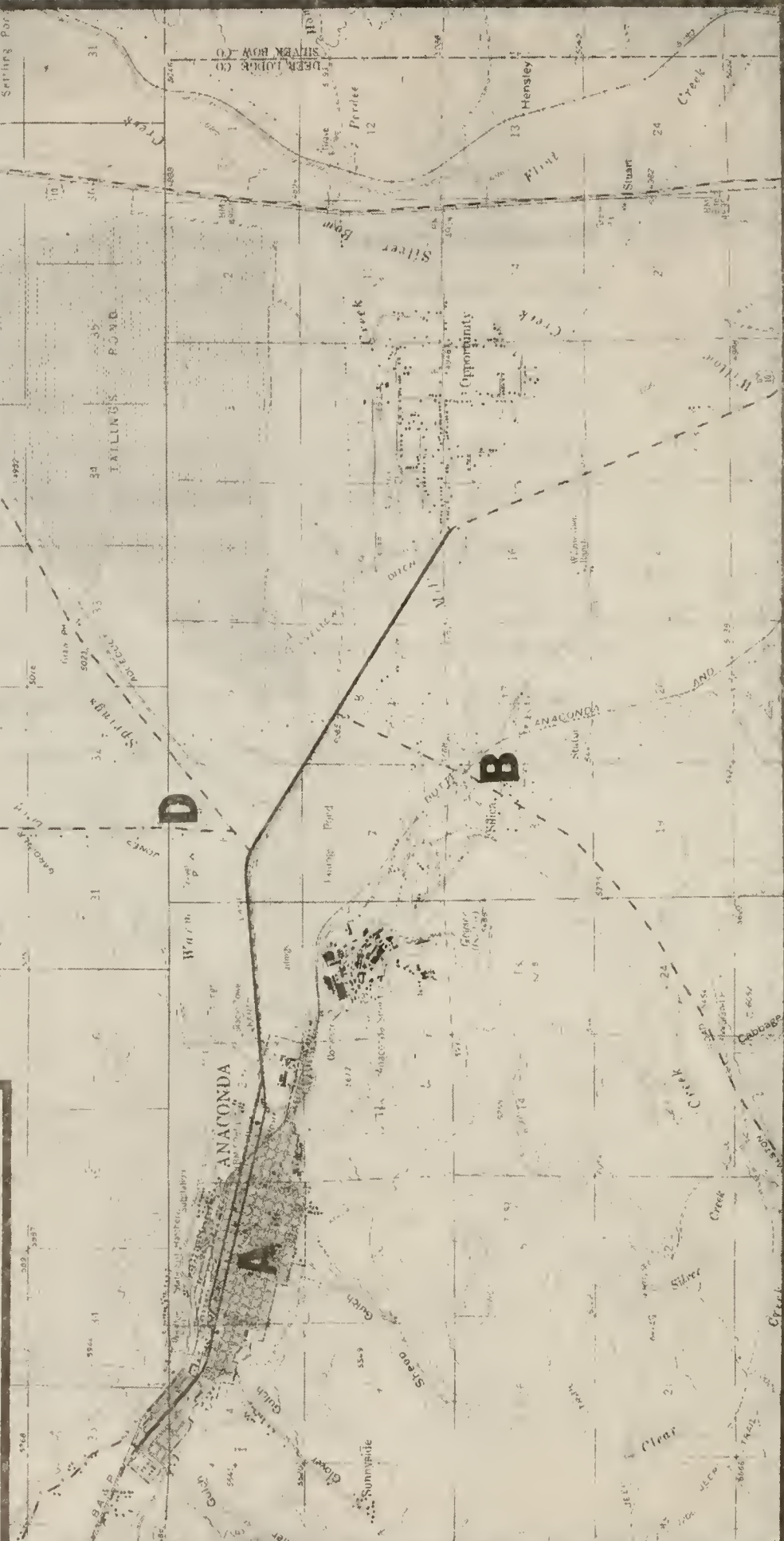
ANACONDA

A LINCOLN SCHOOL

B MILL CREEK

C JOHNSON'S CURVE

D HIGHWAY JUNCTION



Scobey

1. There are three TSP monitoring sites in the vicinity of Scobey. They are operated by the AQB in conjunction with the Poplar River Project. They include the Border site, located at the Canadian border, the Hanrahan site, northeast of Scobey, and the Richardson site just north of town.
2. The purpose of the sites was to measure background particulate levels and later to determine the impact of two 300-megawatt coal-fired power plants built approximately 18 miles north of Scobey near Coronach, Saskatchewan. Both plants at Coronach were commissioned in mid-1983 and are running at 75% capacity at the present time. The sites were shut down in the summer of 1983 and were restarted in July 1984 for the purpose of monitoring while both plants are operating at full or near full capacity.
3. The AQB recommends shutting down TSP monitoring in Scobey on June 30, 1985.

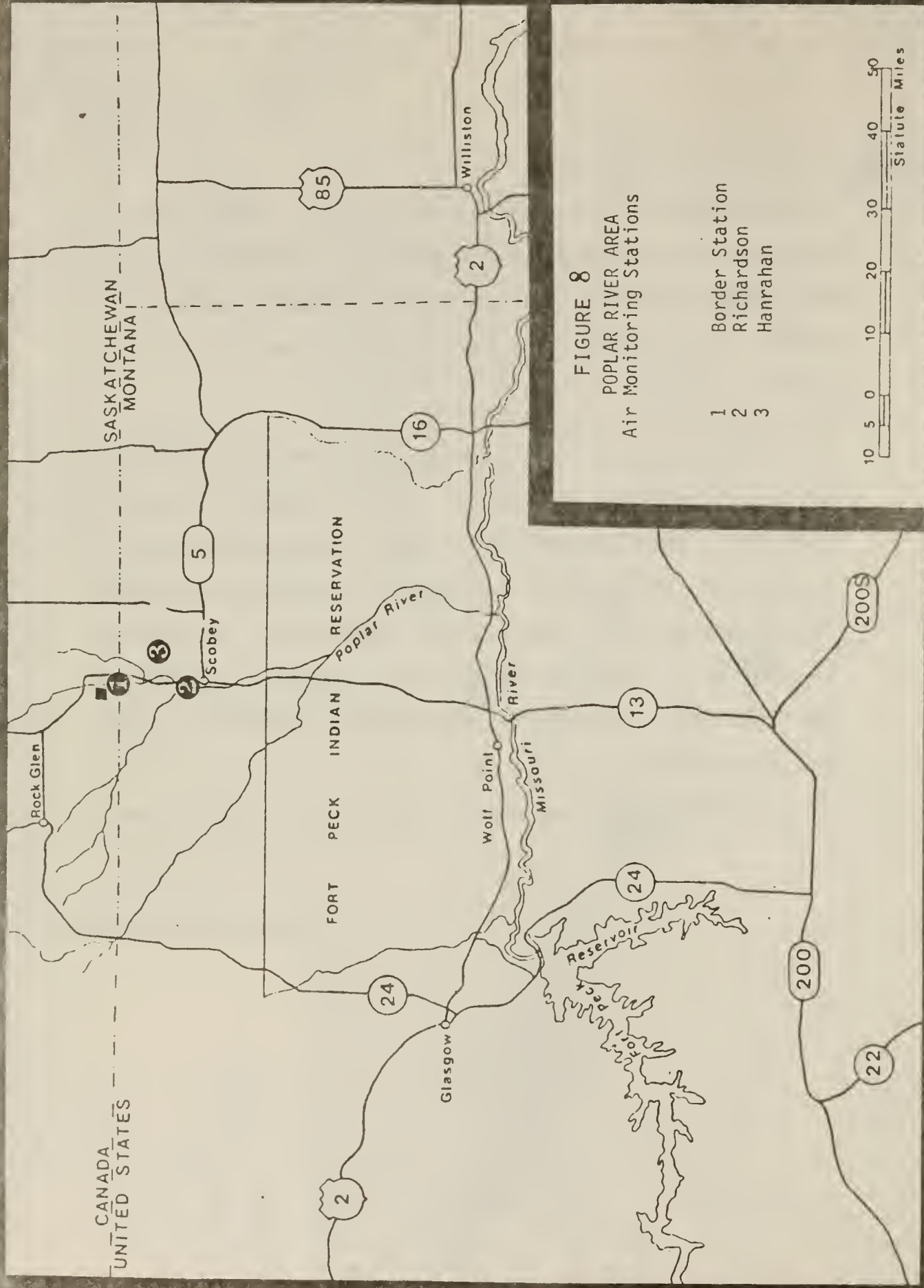


FIGURE 8
POPLAR RIVER AREA
Air Monitoring Stations

- 1 Border Station
- 2 Richardson
- 3 Hanrahan



Missoula

1. All Missoula area monitoring sites recorded approximately the same TSP concentrations during 1982 and 1983. Missoula area TSP levels are summarized in Table 5.
2. The AQB and Missoula County consider the analysis performed during the 1983 Network Review as still applicable and have used the information in the following recommendations.
3. Rose Park showed a slight decrease in the mean TSP concentration from 1982 to 1983. However, this site showed the highest TSP reading in the entire state in 1983, and because it is an essential part of the Missoula network, AQB and Missoula County recommend its continued operation. Missoula County also plans to install a ten micron (PM-10) sampler to determine compliance with the proposed federal standard.
4. There were no significant changes in TSP concentrations at the Courthouse Roof between 1982 and 1983. The AQB and Missoula County recommend that this site continue to be operated because of high TSP reading to maintain the historical data base. Collocated sampling was terminated in the summer of 1983.
5. In 1983, Missoula County started two new monitoring sites, one at Spurgin Road/Tower Road and one in Meadow Hills (south Missoula). Missoula County and the AQB recommend the continuation of these sites for compliance with the TSP standard.
6. During 1981, the Missoula County Health Department established a new site at Boyd Park to monitor CO emissions from residential wood burning. This location was selected based on a survey conducted in 1980 that indicated very heavy use of wood in the area and low vehicle

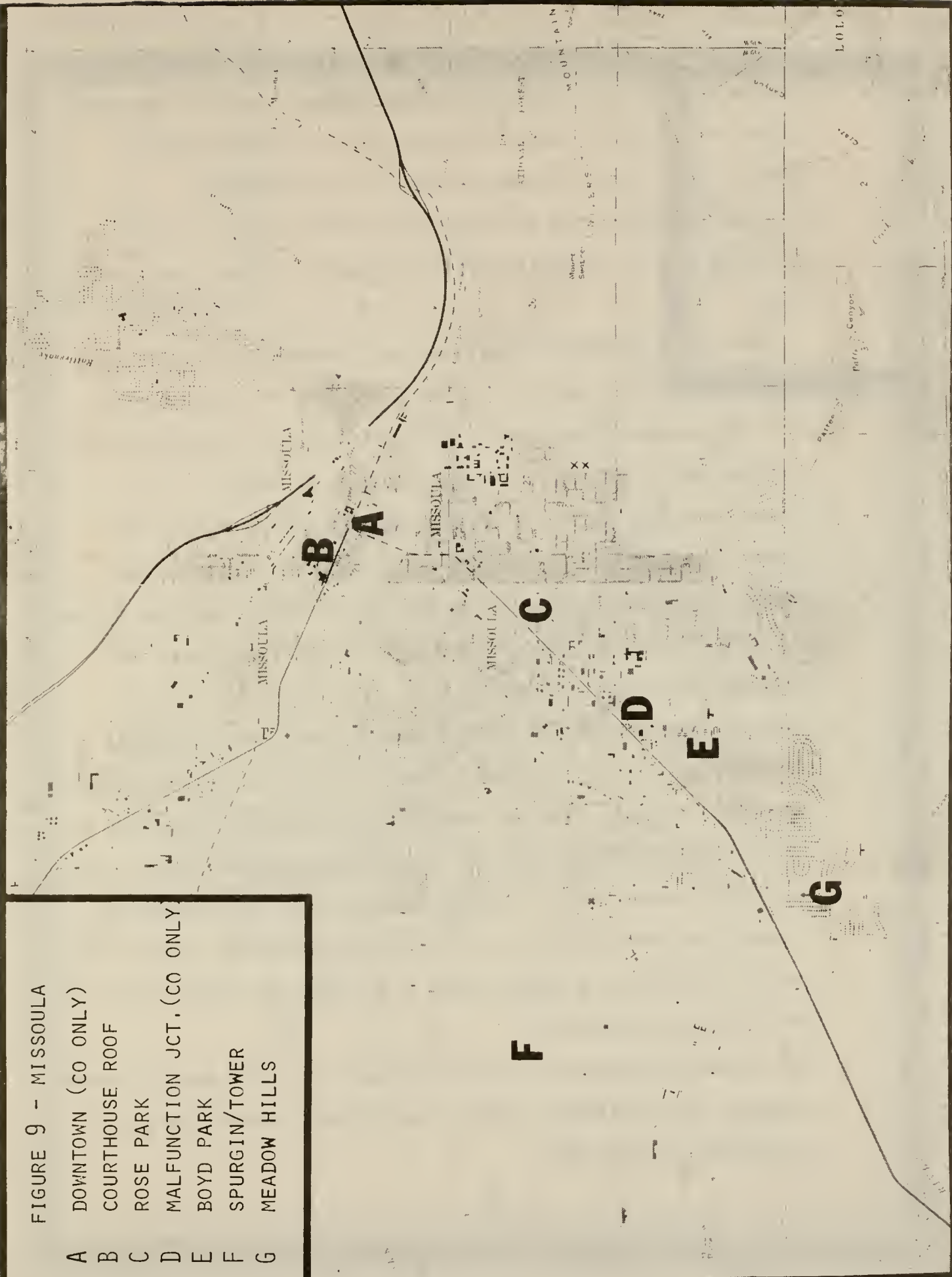
traffic. In conjunction with the new CO monitoring site, TSP sampling was initiated in November of 1981. In November, 1983, Boyd Park became the collocated sampling site for the Missoula County TSP network.

Missoula County recommends continued operation of TSP monitoring and installation of ten micron (PM-10) samplers. The PM-10 sampling will be contingent on state, federal and local funding.

7. Missoula County has plans to establish a TSP monitoring site in East Missoula and/or the Lower Rattlesnake drainage contingent on funding and equipment.

FIGURE 9 - MISSOULA

- A DOWNTOWN (CO ONLY)
- B COURTHOUSE ROOF
- C ROSE PARK
- D MALFUNCTION JCT. (CO ONLY)
- E BOYD PARK
- F SPURGIN/TOWER
- G MEADOW HILLS



Other Western Montana Sites

1. During 1983, Libby continued to record some of the highest TSP concentrations in the state with annual geometric means of 96 and 90 ug/m^3 at the Lincoln County Courthouse and the Brown Residence, respectively. Table 5 summarizes the TSP concentrations.
2. The AQB has shifted the collocated high volume sampler from Butte to Libby in 1984 for conducting precision analysis in the area of highest TSP.
3. A correlation between the Courthouse and Brown Residence sites shows that statistically they are monitoring the same air (see Table 6).
4. The AQB recommends operation of the Courthouse site indefinitely and termination of the Brown Residence site June 30, 1985.
5. The AQB has been monitoring in Thompson Falls for 18 months. The annual geometric mean in 1983 was 72 ug/m^3 , which approaches the federal primary standard. The 24-hour state standard was also violated in 1983. The AQB therefore recommends continued operation of the Thompson Falls site.
6. Table 5 summarizes the TSP data for Hamilton for 1983. The annual geometric mean was 58 ug/m^3 and is slightly under the federal secondary standard (60 ug/m^3). The AQB recommends continuation of this site at least through December, 1984, to establish two complete years of data.
7. The AQB has established high-volume sampling sites in Eureka at the Lincoln Electrical Co-op and in Dillon at the Beaverhead County Courthouse. AQB intends to operate these sites until two complete years of data have been collected.
8. AQB recommended starting a site in Superior in the 1983 Network Review. Although not accomplished in 1984, the AQB plans to establish a site in Superior in early 1985.

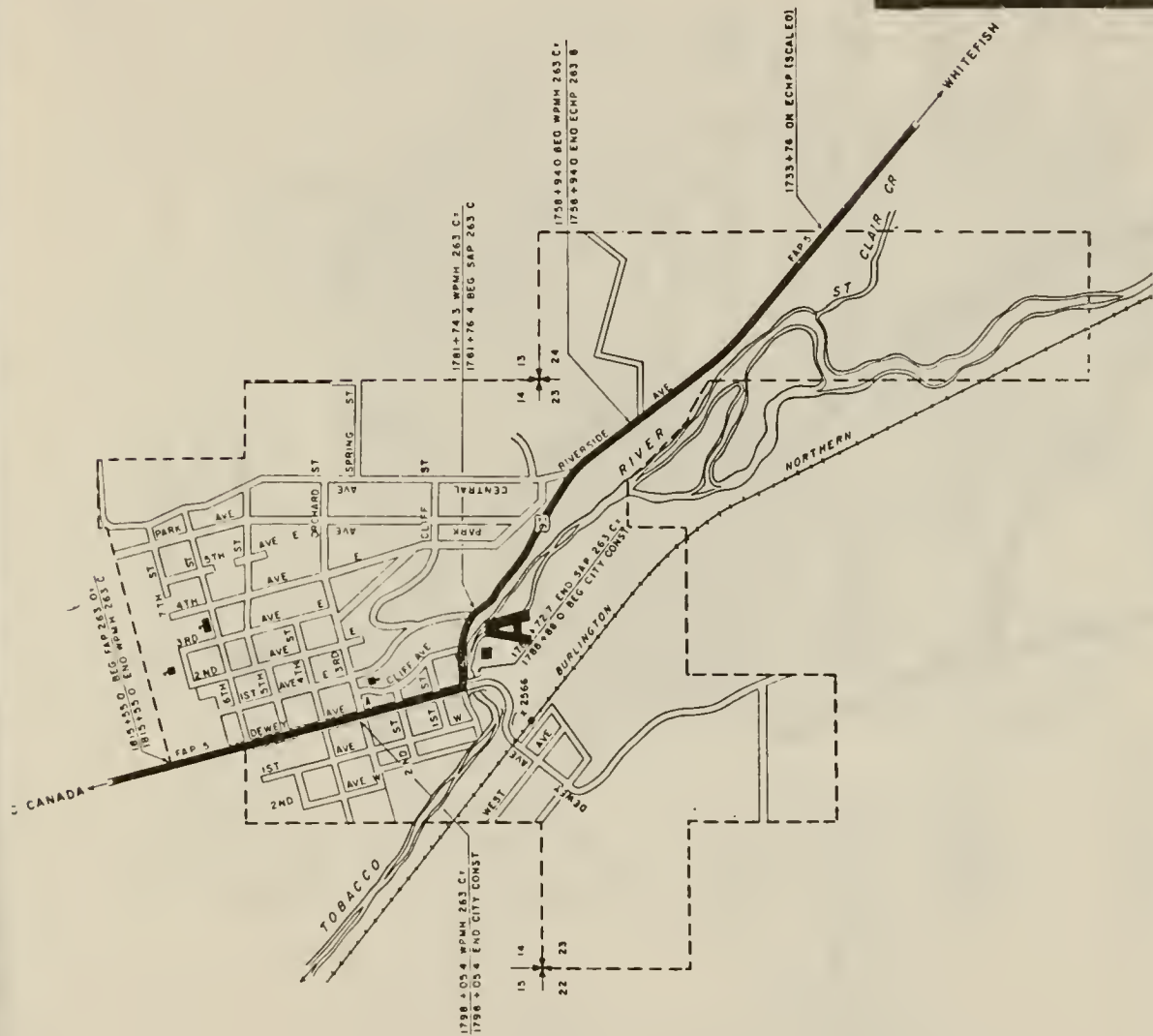


FIGURE 10
EUREKA

A Lincoln Electric Coop.

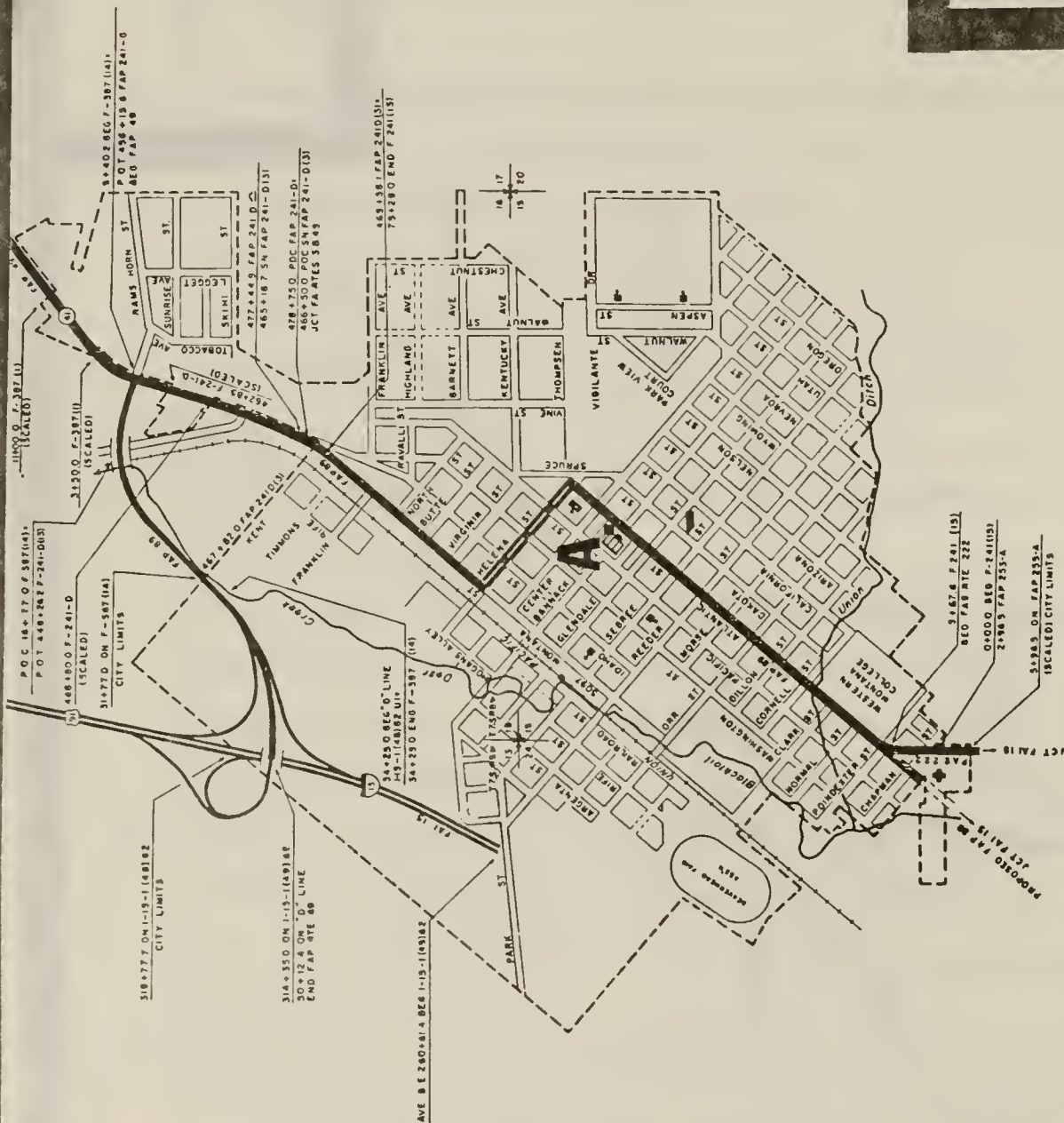


FIGURE 11
DILLON
A Beaverhead County
Courthouse

FIGURE 12
DEER LODGE
A Powell County
Courthouse



FIGURE 13 HAMILTON A RAVALLI COUNTY COURTHOUSE

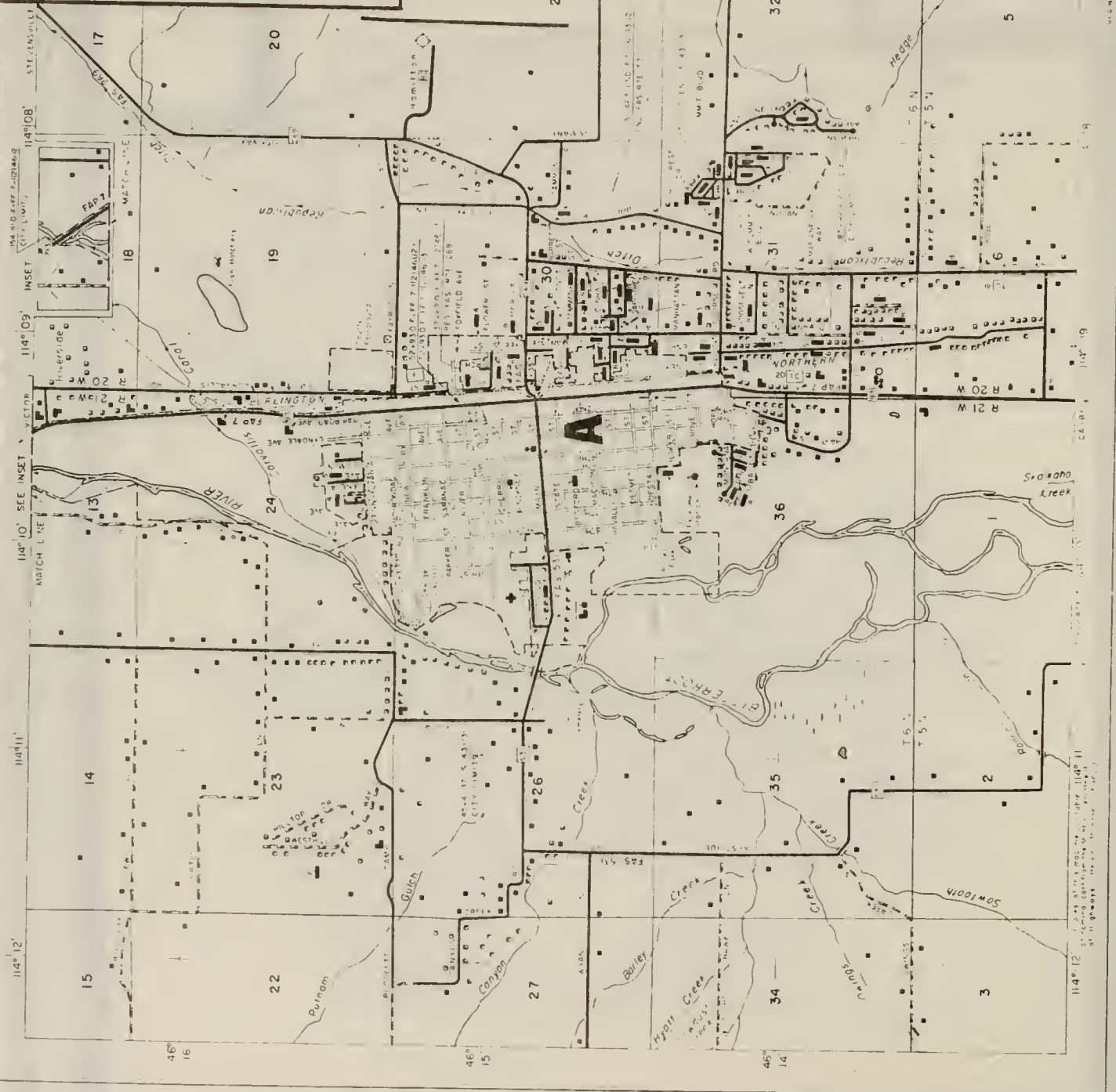
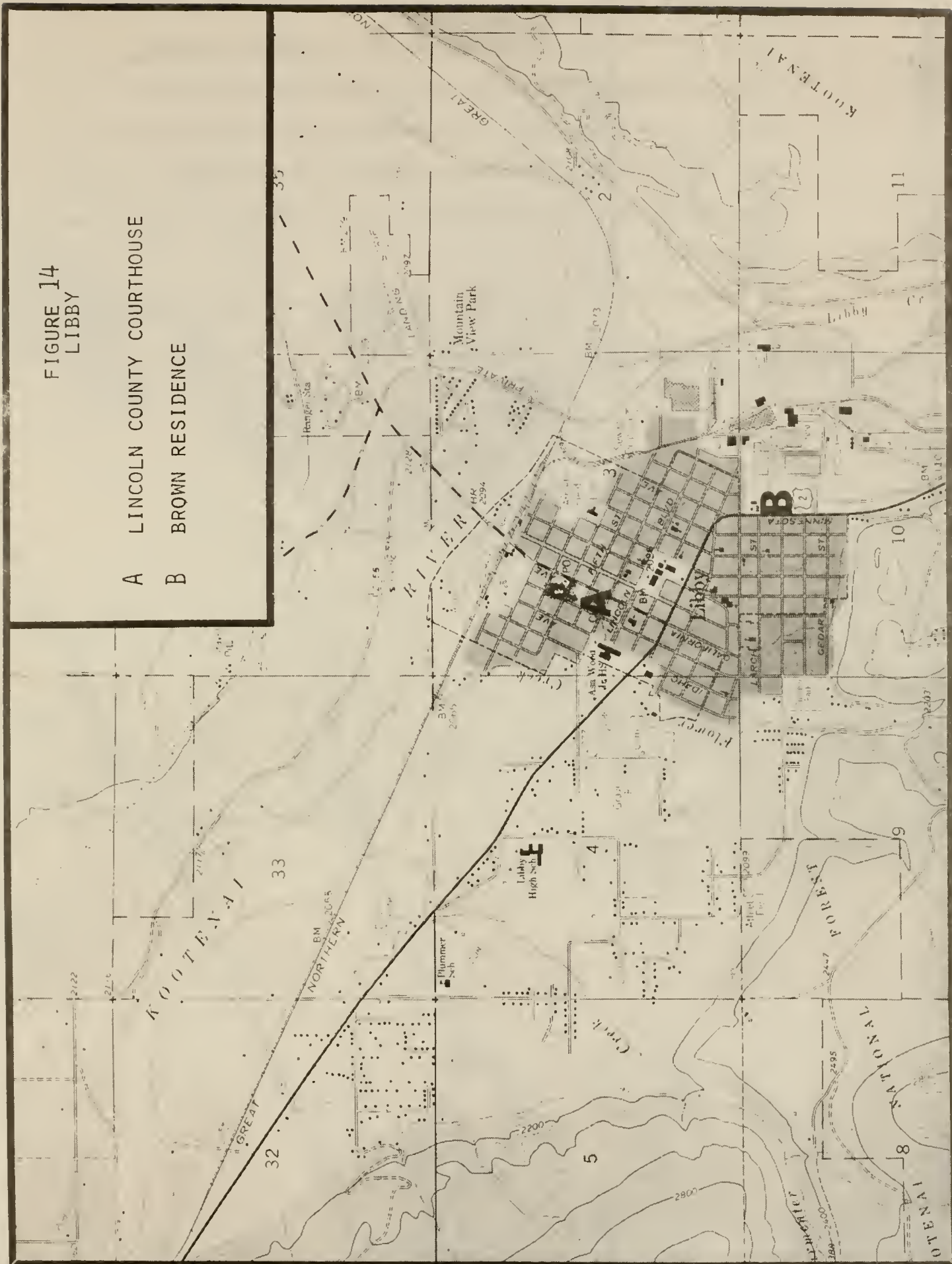


FIGURE 14
LIBBY

- A LINCOLN COUNTY COURTHOUSE
- B BROWN RESIDENCE



Other Eastern Montana Cities

1. The AQB operates two high volume samplers in Eastern Montana. Glendive has shown TSP concentrations well below the secondary standard. The AQB recommends termination of the Glendive site in June, 1985. The AQB recommends the Sidney site be operated an additional year. The TSP concentrations for Glendive and Sidney are summarized in Table 5.
2. The Yellowstone Air Pollution Control maintains a high volume sampler in Laurel at the Junior High School. The monitor is intended to be used for tracking long-term trends.

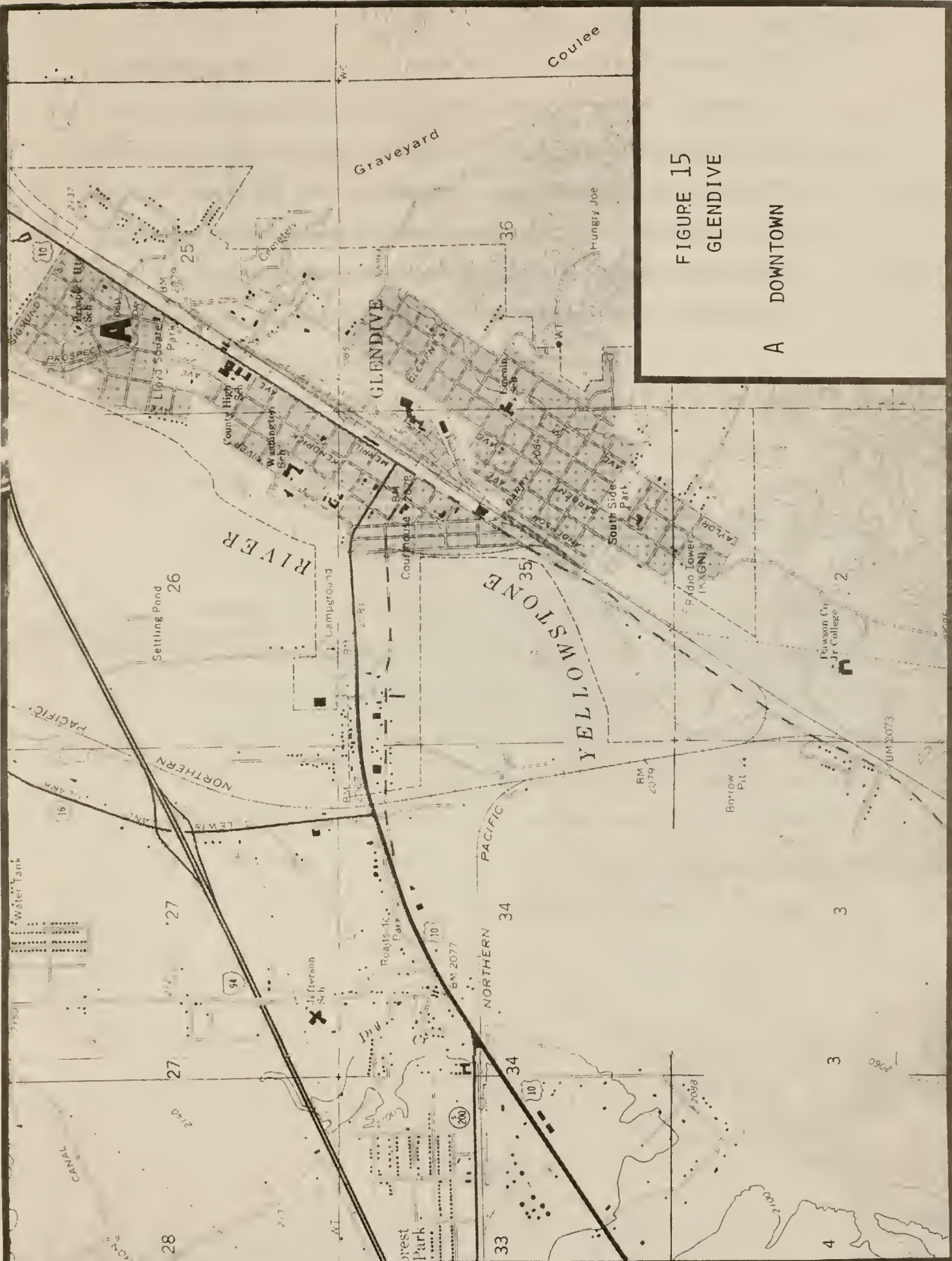


FIGURE 15
GLENDDIVE

A DOWNTOWN

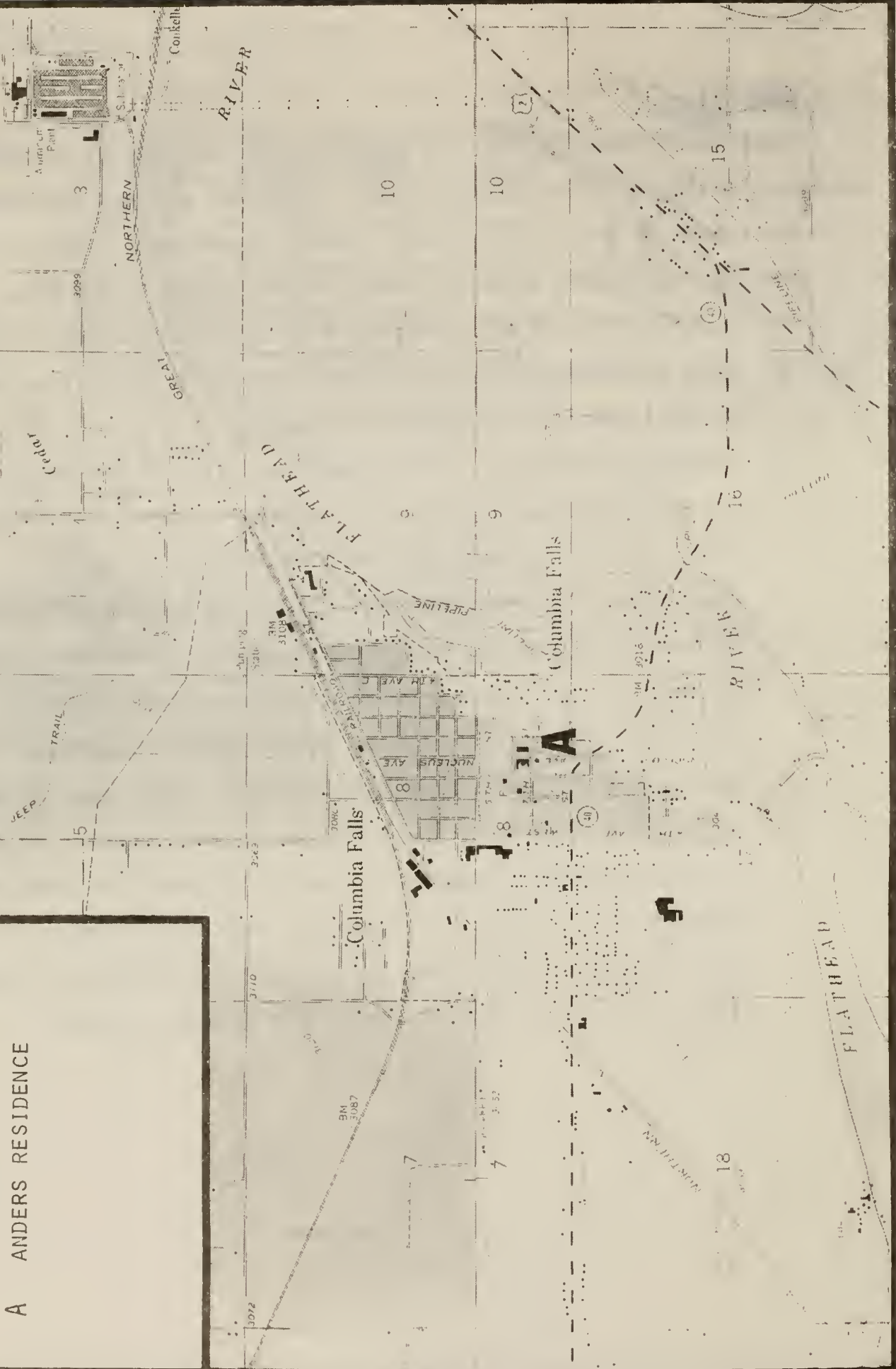
Miscellaneous Source-Oriented Sites

1. The Champion Packaging Division sites HW #1 and HW #2 exhibited very low readings during 1982 and 1983. The annual geometric mean was approximately 26 ug/m^3 for 1982 and 1983. However, the AQB recommends that both sites continue to be operated in order to track plant emissions of TSP and sulfates. These samplers are owned and operated by the Champion Packaging Division of Champion International and analysis and calibration are performed by the Missoula County Health Department.

Flathead Valley

1. Table 5 summarizes the TSP readings for 1982 and 1983 for the Anders Residence site in Columbia Falls. In the past two years the annual geometric mean has been 66 and 69 ug/m³, respectively. There has been only one reading above the federal primary standard in two years, and therefore, the AQB is recommending the nonattainment status of Columbia Falls be redesignated to attainment and the Anders high volume sampler be terminated once redesignation is complete.
2. The Universal Athletics site is located on a roof top one-half block off the main street of Kalispell. The site registered an annual geometric mean for TSP during 1982 and 1983 of 73 and 72 ug/m³, respectively. The highest 24-hour value during 1983 was 370 ug/m³.
3. The Kalispell Courthouse East TSP monitoring site was established in January, 1983, and shows an annual geometric mean of 45 ug/m³ and had no 24-hour violations. In view of the fact that the Courthouse East Annex site in Kalispell shows no violations for over a year, the AQB recommends termination of the Courthouse East site December 30, 1984. The AQB recommends continuation of the U.A. Kalispell site because the geometric mean is close to the federal primary annual standard (73 ug/m³). The high readings are probably due to urban activity that produces high levels of fugitive road dust in downtown Kalispell.

FIGURE 16
COLUMBIA FALLS
A ANDERS RESIDENCE



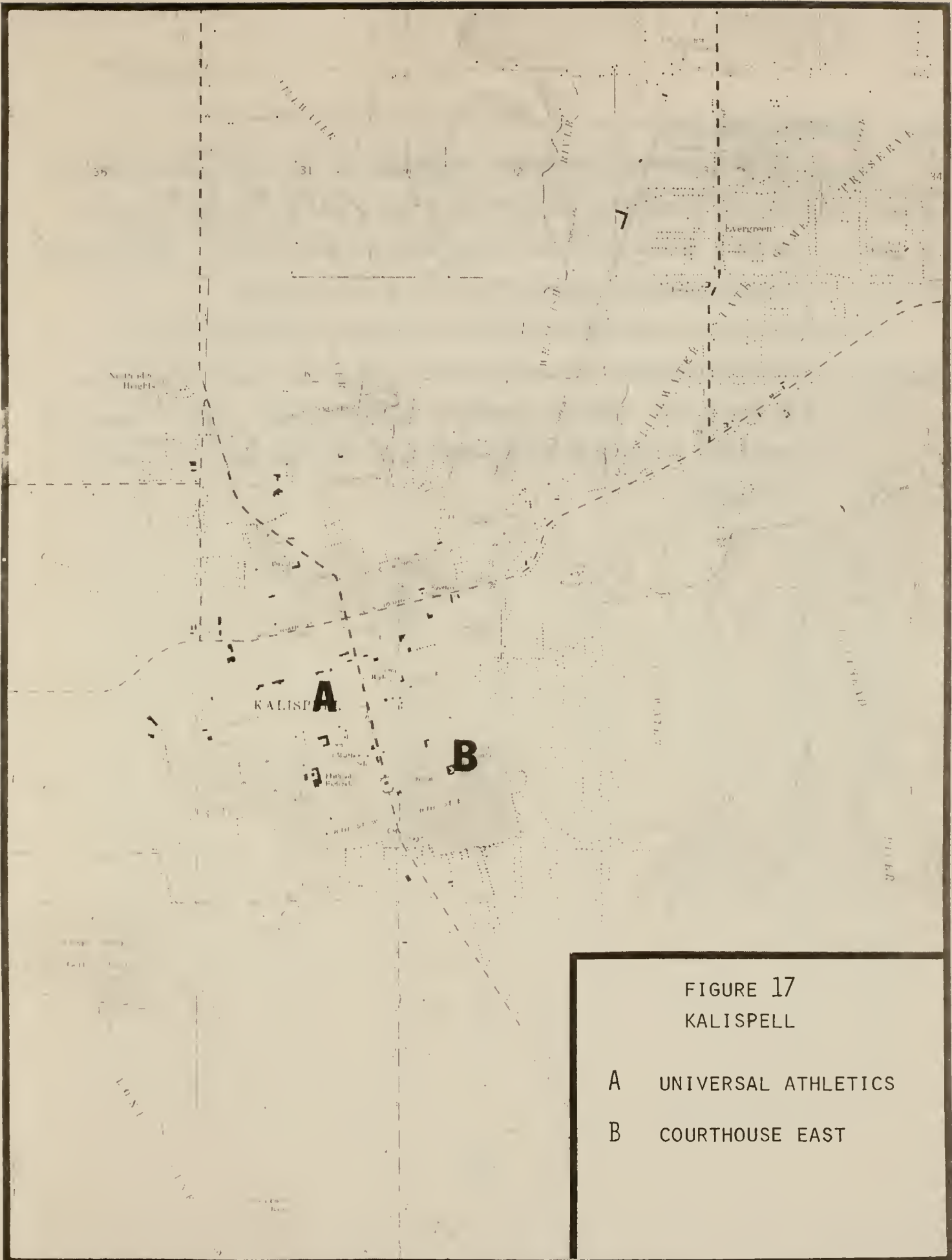


FIGURE 17
KALISPELL

- A UNIVERSAL ATHLETICS
- B COURTHOUSE EAST

Background Stations

1. Montana operates a background sampler at the Smith Ranch near Ovando in western Montana and was operating a background monitor near Jordan in eastern Montana until July, 1984, when the operator quit. We were unable to find a suitable operator so the site was shut down.
2. The Smith Ranch site is located in the sparsely populated upper Blackfoot Valley. The entire area is used almost exclusively for hay production and livestock grazing. The 1982 and 1983 geometric means (14 ug/m^3 and 12 ug/m^3) were both very low, indicating the site is serving its purpose.

Summary

Over the last two years, TSP levels in Montana have shown a downward trend. The decrease is more pronounced in Eastern Montana than in Western Montana.

During the next year, the EPA wants to establish PM-10 monitoring sites in Scobey, Colstrip, Billings, Bozeman, Missoula and Polson. The AQB will have to run 19 new PM-10 monitors at these six sites. The higher probability sites will have to have daily analysis and the lower probability sites will either be 1-in-6 or 1-in-3 day sampling schedules. This increased workload and laboratory analysis will severely hamper the normal network. This network review may be amended at the first of the year to implement the PM-10 monitoring.

TABLE 5

SUMMARY OF TSP CONCENTRATIONS AT MONTANA SAMPLING LOCATIONS

SITE	1983			1982		
	Geo. Mean	1-High	2-High	Geo. Mean	1-High	2-High
Libby-Brown Residence	96	278	250	92	346	282
Libby-Lincoln Co. Court.	90	278	207	--	---	---
Whitefish-Park	*62	197	159	49	138	130
Kalispell-U.A.	72	370	210	73	234	232
Kalispell-Evergreen	--	---	---	44	176	176
Kalispell-Courthouse East	45	129	102	--	---	---
Polebridge	*12	68	63	14	89	60
Flathead-Arlee Pow Wow #1	15	61	59	20	772	77
Flathead-Airport	--	--	--	24	94	89
Columbia Falls-NAAC	*14	21	9	14	49	45
Columbia Falls-Anders Res.	69	274	199	66	241	225
Glacier Nat. Park-West #5	9	40	35	12	51	46
Glacier Nat. Park-East #8	8	33	31	* 5	44	18
Bigfork-Ranger Station	*47	181	12	25	80	78
Polson-MAL	*35	110	104	36	100	95
Swan River	* 1	1	---	23	306	236
Ronan-Ninepipes	*12	58	43	13	71	54
Thompson Falls-Courthouse	72	358	260	--	---	---
Missoula-HW#1	26	80	69	26	102	86
Missoula-HW#2	24	143	101	26	109	105
Missoula-Courthouse	57	316	313	55	256	216
Missoula-Meadow Hills	*62	139	111	--	--	--
Missoula-Spurgin & Tower	*45	125	112	--	--	--
Missoula-Rose Park	50	422	346	52	381	312
Missoula-Northside	*58	180	171	*58	138	127
Missoula-Boyd Park	69	366	336	72	319	309
Missoula-Lolo	*41	150	137	*47	90	85
Ovando-Terry Smith	12	68	57	14	79	79
Anaconda-Lincoln School	36	123	121	35	128	125
Walkerville-Blaine Sch.	--	---	---	21	66	51
Butte-Dr. Canty	*43	187	161	37	158	137
Butte-Hebgen Park #2	*56	222	192	47	184	153
Butte-Greeley Sch. #1	50	229	224	57	225	216
Monida-BLM	--	---	---	* 7	30	28
Helena-Capitol Courts	58	232	212	51	183	166
Helena-Townsend Avenue	*43	119	81	--	--	--
Helena-Cooney Home	33	147	128	*31	75	70
Helena-Cogswell Bldg.	40	193	165	42	114	113
Helena-Super Save	--	---	---	58	188	166

*Less than eight months of data

TABLE 5 Continued

SITE	1983			1982		
	Geo.Mean	1-High	2-High	Geo.Mean	1-High	2-High
E. Helena-Schneider Res.	*36	88	69	--	---	---
E. Helena-Dartman Field	*40	98	95	--	---	---
E. Helena-Hadfield	65	240	232	*61	133	121
E. Helena-Firehall	65	142	136	--	--	--
E. Helena-Hasties	53	135	132	*56	102	101
E. Helena-Dudley Street	*41	90	78	--	--	--
E. Helena-South	31	90	76	*38	88	80
Montana City-School	*67	193	175	*73	188	182
Great Falls-Riverview Sch.	--	---	---	40	120	109
Great Falls-Downtown	42	108	105	49	107	107
Great Falls-Fire Sta. #1	49	163	112	67	204	180
Great Falls-Lincoln Sch.	--	---	---	44	124	99
Great Falls-Kiwanis Park	--	---	---	39	89	75
Great Falls-Black Eagle	55	201	171	64	216	144
Great Falls-Franklin Sch.	43	104	91	--	---	---
Bozeman-Traphagen	--	---	---	25	59	56
Bozeman-Whittier Sch.	47	118	114	47	143	125
Bozeman-East Main	56	265	180	59	137	136
Havre-Central Bldg.	*49	174	147	58	183	160
Lewistown-Downtown	*34	93	45	40	125	96
Laurel-Jr. High	35	81	59	33	77	74
Laurel-New Farm	--	---	---	*28	107	60
Billings-KGHL	--	---	---	38	92	89
Billings-Grand Ave.	51	148	143	56	124	119
Billings-City Hall	55	152	127	59	153	107
Billings-Taft Sch.	56	217	207	54	162	152
Billings-Lockwood Sch.	*38	60	52	37	100	82
Billings-Lockwood Park	*60	293	186	--	---	---
Billings-Sandstone Sch.	28	76	61	--	---	---
Malta/BLM	*17	44	42	*16	65	41
Scobey-Border	* 9	58	50	17	234	50
Scobey-Richardson	*11	233	54	*13	63	28
Scobey-Hanrahan	*11	108	56	16	144	47
Jordan-Billing Ranch	*13	43	41	* 8	19	15
Miles City-PCA	*50	187	125	40	118	106
Glendive-Dawson College	--	---	---	22	54	48
Glendive-Medical Arts. Bldg.	*24	60	58	*25	66	52
Lindsay-Weilgosh	--	---	---	*23	74	24
Plevna/BLM	*23	121	107	*22	98	79
Hamilton-Courthouse	58	181	164	--	---	---
Sidney-Downtown	*51	116	96	--	---	---

*Less than eight months of data

TABLE 6

COMPARISON OF THE TWO LIBBY HIGH VOLUME SAMPLER SITES

Sites	Data Points	Mean	Standard Deviation	Standard Error
Brown Residence	45	101.5	43.5	6.5
Lincoln County Courthouse	45	100.8	52.9	7.9

Regression Analysis	Mean Deviation	Standard Deviation	Standard Error	Correlation Coefficient
Brown Residence vs. Lincoln County Courthouse	0.6667	25.3	3.778	0.880

LEAD (Pb)

On October 5, 1978, the EPA promulgated an ambient air quality standard for lead (1.5 ug/m^3 quarterly arithmetic mean). As a criteria pollutant, the EPA required monitoring for lead in urbanized areas over 500,000 population, in the vicinity of certain categories of major stationary sources which are known lead emitters, and in areas known to be exceeding the standard. In Montana, two areas were affected by these regulations: the area surrounding the Anaconda Copper Smelter in Anaconda, and in the vicinity of the ASARCO lead smelter in East Helena.

Anaconda

1. During July of 1980, a labor strike closed the Anaconda smelter. In September, management announced the permanent closure of the plant. The AQB will continue to conduct lead monitoring in the Anaconda area at the Lincoln School and the Highway Junction sites as long as lead analysis is being done on a routine basis in East Helena. The Anaconda smelter had been in the process of being demolished and the AQB has been operating and will continue to operate two TSP monitors in the area and analyze for lead. There has not been any significant TSP lead level measured in the Anaconda area since demolition started in 1982.

East Helena

1. The AQB, in conjunction with ASARCO, is running a lead sampling network in the East Helena area. The sampling sites are the same as the TSP sites (see Figure 5). The sites run by the AQB are Dartman and South, and ASARCO runs Hadfield, Hastie, and Firehall. The quarterly lead values are summarized in Table 7.

The AQB does not anticipate any changes in the East Helena lead sampling program.

TABLE 7

QUARTERLY LEAD - EAST HELENA

ug/m³

Site	1982		1st Qtr.	2nd Qtr.	1983	
	3rd Qtr.	4th Qtr.			3rd Qtr.	4th Qtr.
Hastie	2.27	2.25	3.29	2.49	2.94	3.03
Hadfield	2.48	2.18	3.45	*	2.67	3.10
Firehall	*	*	*	*	4.80	5.26
South	1.52	0.93	0.97	0.42	0.28	0.66
Dartman	*	1.21	1.60	*	3.22	2.82

*Not enough data for valid quarter.

Jefferson City

AQB would like to initiate TSP and lead monitoring in the Jefferson City area due to high readings obtained in a State Lands study conducted in 1983 and 1984.

Lead in Cities

AQB would like to do a survey of lead in the major metropolitan areas of Montana. This would be done by analyzing 3-month composite analyses of current TSP filters.

SULFUR DIOXIDE (SO₂)

The AQB is presently monitoring SO₂ in two areas of the state: Scobey, and the Billings-Laurel area.

Scobey

1. The AQB is monitoring SO₂ at two locations near Scobey (Figure 10) as part of the Poplar River Basin Environmental Impact Study. The locations are: the Border site located on the Canadian Border north of Scobey and the Hanrahan site 13 miles northeast of Scobey. The sites were situated to gather baseline data prior to the start-up of two 300 megawatt coal-fired power plants at Coronach, Saskatchewan. These sites were chosen as areas of highest SO₂ concentrations based on dispersion modeling performed by an AQB contractor.
2. The AQB shut sampling down in June, 1983. When both Coronach units are commissioned and on line permanently, the AQB intends to gather one more year of data. Both units were on line in October, 1983, but the AQB decided to start the final year of data when both units have been up and running for some time. The final year of sampling started on July 1, 1984, and will be terminated on June 30, 1985.
3. A comprehensive sulfation plate network was also initiated in the last year of operation to help establish a baseline with the final year of monitoring. The sulfation plates will continue to measure any changes in ambient SO₂ levels after continuous monitoring is terminated.
4. During 1982-1983, SO₂ concentrations were very low at both sites. The maximum one-hour concentrations were 0.060 ppm at the Border site and 0.029 ppm at the Hanrahan site in 1982, and 0.034 at the Border site

and 0.024 at the Hanrahan site in 1983. These readings occurred during November, 1982 and February, 1983.

5. Federal funding for the air quality portion of the Poplar River Study ceased as of July 1, 1981. The Montana Legislature appropriated sufficient funds to continue SO₂ monitoring in the Scobey area until July 1, 1985.

Billings

1. Sulfur dioxide monitoring has been conducted in Billings since 1974.
The AQB operates three SO₂ continuous monitoring sites in the Billings area. These are: North Johnson Lane, Lockwood Park, and Coburn Road. At each site, the AQB operates SO₂ accompanied by continuous wind speed and direction.
2. The AQB requested the redesignation of the Billings SO₂ NAMS site from Taft School to Lockwood Park. The change was granted in 1983, and on January 1, 1984, the Taft School SO₂ monitoring was shut down.
3. A summary of SO₂ data for Billings is in Table 8. The AQB anticipates no changes in the Billings SO₂ network at this time.

TABLE 8
SUMMARY OF SO₂ READINGS IN BILLINGS

Site	Highest 1-hour	Highest 3-hour	Highest 24-hour	Ann. Avg.
N. Johnson Lane	.458	.301	.120	.025
Lockwood Park	.502	.393	.131	.029
Coburn Road	.778	.651	.222	.028

Sidney

1. Sidney is located along the Yellowstone River 25 miles upstream of its confluence with the Missouri River in North Dakota. Sidney lies in the Williston Basin, which is experiencing an economic boom due to oil and natural gas development. As can be seen from Table 10, several large SO₂ sources exist in the area. In addition to these well-known sources, there are numerous oil and gas wells scattered over the area which are either directly venting H₂S or flaring it. The AQB has received numerous complaints from area residents concerning H₂S and SO₂ concentrations.
2. In August of 1981 the AQB established a small sulfation plate network in the area. However, due to operator problems, data collection did not get started until June of 1982. In December, 1981, Del Green and Associates completed a contract with the Department to inventory H₂S and SO₂ emissions from wells throughout the Montana portion of the Williston Basin. Due to the number of wells, only about 11 percent of the wells were inventoried. Based on these findings, Del Green and Associates projected 210,000 tons of SO₂ emissions from oil and gas wells in the Williston Basin. The AQB has conducted their own investigations which indicate these projections may be substantially overestimated.
3. The sulfation plates in the Sidney area show no real impact from SO₂. The AQB suspects that sour gas flaring is very inefficient and emissions are H₂S and other sulfur compounds, not SO₂. As a result, the AQB intends to monitor H₂S and SO₂ with a portable monitor. If the results warrant, continuous monitoring may be initiated in 1986.

TABLE 9

POINT SOURCE PARTICULATE EMISSION ESTIMATES FOR 1983

Source	Part. Tons/Yr	County	City
Exxon Co. USA	612	Yellowstone	Billings
Continental Oil Co.	249	Yellowstone	Billings
Montana Power Co (Corette)	989	Yellowstone	Billings
East Decker Coal	*1995	Bighorn	Decker
Westmoreland Resources	*1180	Bighorn	Hardin
Cenex	568	Yellowstone	Laurel
West Decker Coal	*2136	Bighorn	Decker
Spring Creek Coal	*2001	Bighorn	Decker
Great Western Sugar	114	Yellowstone	Billings
Bighorn Calcium	* 240	Bighorn	Warren
Simmons Petroleum	116	Cascade	Great Falls
Kaiser Cement	475	Jefferson	Montana City
ASARCO smelter	310	Lewis&Clark	East Helena
Ideal Basic Industries	* 152	Gallatin	Trident
Stauffer Chemical Co.	410	Silver Bow	Ramsay
Pfizer Talc	175	Beaverhead	Dillon
Cyprus Industrial Minerals	132	Gallatin	Three Forks
Louisiana Pacific Corp.	139	Powell	Deer Lodge
Western Energy	*4796	Rosebud	Colstrip
Montana Power Co. 1 and 2	887	Rosebud	Colstrip
Montana Power Co. 3	1250	Rosebud	Colstrip
Peabody Coal	*1164	Rosebud	Colstrip
Montana Dakota Utilities	132	Richland	Sidney
Knife River Coal	* 150	Richland	Savage
Holly Sugar	389	Richland	Sidney
St. Regis Paper Co.	696	Lincoln	Libby
Missoula White Pine & Sash	* 384	Missoula	Missoula
Champion Int. Packaging	756	Missoula	French town
Champion International	287	Missoula	Bonner
Louisiana Pacific Particleboard	761	Missoula	Missoula
Plum Creek Lumber	* 275	Lake	Pablo
Flathead Lumber	224	Lake	Polson
Plum Creek Lumber	199	Flathead	Columbia Falls
Plum Creek Lumber	149	Flathead	Kalispell
Flodin Lumber	* 180	Sanders	Thompson Falls
W. I. Forest Prod. Inc.	* 122	Sanders	Thompson Falls
American Timber	* 113	Flathead	Olney
Stoltze Land & Lumber	* 374	Flathead	Columbia Falls
Louisiana Pacific	* 113	Sanders	Trout Creek
Ksanka Lumber	* 112	Lincoln	Fortine
Anaconda Aluminum	1331	Flathead	Columbia Falls

*Fugitive emissions associated with mining and vehicle traffic are included.

TABLE 10

POINT SOURCE SULFUR DIOXIDE EMISSION ESTIMATES FOR 1983

Source	S02 Tons/Yr	County	City
Exxon Co., USA	10735	Yellowstone	Billings
Montana Power Co. (Corette)	9811	Yellowstone	Billings
Farmers' Union CENEX	10380	Yellowstone	Laurel
Continental Oil Co.	3051	Yellowstone	Billings
Montana Sulfur	2136	Yellowstone	Billings
Great Western Sugar	711	Yellowstone	Billings
Westmoreland Resources	* 57	Big Horn	Hardin
East Decker Coal	* 46	Big Horn	Decker
Spring Creek Coal	* 17	Big Horn	Hardin
West Decker Coal	* 46	Big Horn	Decker
Simmons Refinery	1172	Cascade	Great Falls
WESTCO	6	Glacier	Cut Bank
ASARCO	28740	Lewis & Clark	East Helena
Ideal Basic Industries	130	Gallatin	Trident
Kaiser Cement	44	Jefferson	Montana City
Oil and gas flaring	30000	Williston Basin**	
Montana Dakota Utilities	2192	Richland	Sidney
Shell Oil, gas plant	1278	Richland	Sidney
CENEX--BN and Edeburn wells	150	Richland	Sidney
Perry Petrolane, gas plant	867	Richland	Sidney
American Colloid	63	Phillips	Malta
KENCO	55	Roosevelt	Wolf Point
Western Energy Coal	* 46	Rosebud	Colstrip
Peabody Coal	* 17	Rosebud	Colstrip
Anaconda Co. Aluminum	2646	Flathead	Columbia Falls
Champion Int., Packaging Div.	541	Missoula	French town
W. R. Grace	167	Lincoln	Libby
Stoltze Land and Lumber	37	Ravalli	Darby

*Includes tailpipe emissions from diesel powered vehicles.

**Estimated emissions for oil field gas flaring in the Williston Basin.

CARBON MONOXIDE (CO)

Automobile exhaust is the principal source of CO emissions, although some industries also emit CO, and agricultural or forestry burning are contributors in some areas. In some western Montana valleys, residential wood burning is an important source.

County personnel are currently monitoring CO at one site each in Billings (Yellowstone County), Great Falls (Cascade County), and Missoula (Missoula County).

Billings

1. The Billings downtown area was designated non-attainment for carbon monoxide due to high readings in the past. These readings were taken at the 27th and Montana site but this site had to be removed due to building construction. A new site was established at the Billings Metra-Fairgrounds complex.
2. The Fairgrounds site is located some distance from Exposition Drive due to siting problems. Therefore, the relatively low CO concentrations observed were expected. The Yellowstone County Air Pollution Control agency plans to use data from this site to calibrate a model of Exposition Drive emissions and to thereby provide control strategy tracking. Exposition Drive was completed in November, 1983. The AQB recommends the continued operation of this site for at least six months after the improvements to Exposition Drive have been completed. The Metra site will be shut down in March, 1985, if a six-month continuous data base exists.

Great Falls

1. In 1979 CO sampling was conducted at 10th Avenue South and 9th Street. This site was used to designate the area non-attainment. Due to a leasing problem, the site had to be relocated a short distance away on 10th Avenue South at the Great Falls Federal Savings and Loan Building. In November of 1983, the site was re-established at 10th Avenue South and 9th Street (Pardis Clinic) and has run for one full year.
2. During 1983, CO levels at the Pardis Clinic site exceeded the Montana eight-hour standard of 9 ppm only once. An eight-hour average of 10.3 ppm was registered on December 11. During 1982, there were no exceedances of the eight-hour standard at the Great Falls Federal site.
3. The AQB recommends that the Great Falls Pardis site continue to be operated for at least another year.

Missoula

1. Part of Missoula was designated non-attainment for CO based on high concentrations recorded at the Malfunction Junction site. This site is located near the congested intersection of South Avenue, Russell Street, and U. S. 93. Violations of the 8-hour CO standard have also been observed at the Rose Park and Boyd Park sites.
2. The Boyd Park location was chosen as an alternative site in order to study CO concentrations in an area with low traffic volume and high residential wood use. During 1983 the highest 8-hour concentration recorded at Boyd Park was 9.4 ppm on January 12. AQB speculates that during the winter, high CO concentrations exist throughout the Missoula metropolitan area. The AQB and Missoula County recommend that this site continue to be operated for compliance purposes.
3. Malfunction Junction SE (MJSE) CO monitoring was temporarily stopped until the reconstruction of U. S. Highway 93 from Mount to Dixon is completed. At this time, the construction bids have been let and the project is slated for completion in the fall of 1985. After the project is completed, CO monitoring will be resumed at the MJSE site to ascertain whether the construction decreased CO levels enough to merit redesignation to attainment.
4. Missoula County, in an effort to ascertain the geographic spread of CO problems, plans to monitor CO in other residential districts.

Additional CO Monitoring

AQB proposes monitoring of CO in downtown Billings street canyons and Helena's Last Chance Gulch. These two sites as well as the proposed Missoula site are contingent upon substantial funding to purchase new monitoring and calibration equipment and installation of site, including major maintenance of old monitoring trailers.

FLUORIDES (F⁻)

During 1981 the Montana Board of Health and Environmental Sciences adopted new ambient standards for fluorides. The standards are based on the concentration of fluoride in forage. The standards were set at 50 ppm for a monthly average and 35 ppm for a grazing season average.

The AQB is auditing vegetation sampling conducted by the Stauffer Chemical Company and the Anaconda Aluminum Plant to determine compliance. In addition the AQB receives sample splits from both companies and analyzes them in the Department's laboratory.

SULFATION RATE

In addition to continuous SO₂ monitors, the AQB will continue to use sulfation plates as indicators of sulfur emissions. The AQB will continue to use sulfation plates in Sidney and Scobey. The Yellowstone County Air Pollution Control will continue to run plates in Billings.

OZONE (O₃)/NITROGEN DIOXIDE (NO₂)

AQB is not monitoring for O₃ or NO₂ as past monitoring under the MAPS study indicated that neither pose a problem in Montana.

PRIORITIZATION OF PROPOSED NETWORK MODIFICATIONS

Table 11 presents a prioritized list of proposed modifications to the Montana ambient air monitoring network. The bureau prioritized this list based on the importance of the changes and the financial costs involved. It is the bureau's policy to operate the existing network correctly before initiating new projects; therefore, many quality assurance items are prioritized quite high.

The AQB will initiate the proposed modifications starting with item number 1 and proceeding to item number 18 as manpower and money are available. However, the first group of modifications will be completed before each subsequent group is started.

TABLE 11

LIST OF PROPOSED MODIFICATIONS TO THE MONTANA AMBIENT MONITORING NETWORK

1. Start carbon monoxide monitoring at Malfunction Junction in Missoula by October 1, 1985.
2. Terminate collocated TSP sampling at Greeley School in Butte and commence collocated sampling at the Lincoln County Courthouse in Libby.
3. Designate the Boyd Park and Courthouse Roof TSP sites in Missoula as NAMS.
4. Start TSP monitoring in Superior, Montana.
5. Terminate TSP sampling at the Whittier School site in Bozeman.
6. Terminate TSP sampling at the Medical Arts Building in Glendive.
7. Terminate TSP sampling at the Brown's residence in Libby.
8. Put monitor back in Winnett pending funding and availability of a suitable location.
9. Start TSP sampling in East Missoula.
10. Terminate TSP sampling at the Courthouse East site in Kalispell.
11. Start TSP sampling in the Lower Rattlesnake area of Missoula.
12. Start TSP sampling in the southeastern section of Great Falls.
13. Start TSP and metal sampling at Corbin Flats near Jefferson City.
14. Start TSP sampling in the northeastern section of Bozeman.
15. Initiate a sulfur dioxide and hydrogen sulfide survey in the Sidney area using a portable monitor.
16. Initiate a lead monitoring survey in Missoula, Great Falls, Helena, Butte, Bozeman, and Billings by analyzing a three month composite of high-volume sampler filters.

17. Start monitoring for carbon monoxide at an additional residential area in Missoula.

18. Start monitoring for carbon monoxide in a street canyon in downtown Helena.

19. Start monitoring for carbon monoxide in a street canyon in downtown Billings.

RATIONALE FOR SITE DESIGNATIONS

The Bureau's stations are designated either NAMS, SLAMS or SPM, depending on the general purpose of the station and the period of time it is expected to operate.

In general, NAMS and SLAMS are intended to operate for long periods of time. Stations established for short-term measurements are normally designated SPM. If it is later decided to maintain the station beyond its originally projected closing date, the station could be redesignated SLAMS.

Table 12 lists the Bureau's NAMS, SLAMS and SPM stations, their projected closing dates, and the reasons for their operation.

TABLE 12

MAJOR STATION DESCRIPTIONS AND COMPARISONS

Monitoring Station	SLAMS	NAMS	SPM
Purpose	General program monitoring for criteria pollutants. Supplies data for state implementation plan (SIP). Used for emergency episode monitoring.	Sets national policy, obtains long-term trend data, is used in special national studies, and is selected to monitor highest pollution areas which also have high population.	Special and short-term monitoring according to Montana needs. Monitors non-criteria pollutants.
Installation Deadline	January 1, 1983	January 1, 1981	None
Review Frequency	Annual	Every third year	Annual
Relocation Frequency	Relocated or changed only on annual basis if necessary and with EPA approval.	Not to be moved without prior EPA approval	No restrictions
Data Reporting	Beginning in 1981, annual reports due by July 1st of the following year to EPA Region and headquarters in N. Carolina.	Same	No reports due unless data is used for SIP purposes.
Report Requirements	Detailed summary, including violations of standards.	Same	None

TABLE 13
SAMPLING AND ANALYSIS METHODS

<u>Parameter</u>	<u>Method</u>
TSP - all sites	High Volume Method 40 CFR, Part 50, Appendix B
Pb - all sites	High Volume Method 40 CFR, Part 50, Appendix B
SO ₂ - all sites	EQSA-0276-009 "Thermo Electron Model 43 Pulsed Fluorescent SO ₂ Analyzer"
CO - all sites	RFCA-0276-008 "Bendix Model 8501- 5CA Infrared CO Analyzer"
	RFCA-0381-051 "Dasibi Model 3003 Gas Filter Correlation CC Analyzer"
O ₃	EQ0A-0577-019 "Dasibi Model 1003- AH, 1003-PC, or 1003-RS Ozone Analyzers"
NO ₂	RFNA-0677-021 "Monitor Labs Model 8440E Nitrogen Oxides Analyzer"

TABLE 14

SUMMARY OF PROBE SITING CRITERIA

<u>Pollutant</u>	<u>Scale</u>	<u>Height above Ground, meters</u>	<u>Distance from Supporting Structure in Meters</u>		<u>Other Spacing Criteria</u>
			<u>Vert.</u>	<u>Horiz.</u>	
TSP	All	2-15	--	2	1. Must be >20 meters from dripline of trees 2. Distance from sampler to obstacle must be at least twice the height the obstacle protrudes above the sampler. 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby. 5. Must have minimum spacing from roads. This varies with height of monitor and spatial scale.
SO ₂	All	3-15	1	1	1. Must be >20 meters from dripline of trees. 2. Distance from inlet probe to obstacle must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. No furnace or incineration flues should be nearby.
CO	Micro	3 ± 1/2	1	1	1. Must be >10 meters from intersection and should be at a midblock location. 2. Must be 2-10 meters from edge of nearest traffic lane. 3. Must have unrestricted airflow 180° around the inlet probe. 4. Must be >20 meters from dripline of trees.

C0	Middle and Neighborhood	3-15	1	1	1. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 2. Spacing from roads varies with traffic.
O3	All	3-15	1	1	1. Must be >20 meters from dripline of trees. 2. Distance from inlet probe to obstacle must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic.
NO2	All	3-15	1	1	1. Must be >20 meters from dripline of trees. 2. Distance from inlet probe to obstacle must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic.
Pb	Micro	3-15		>2	1. Must be >20 meters from dripline of trees. 2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby. 5. Must be 5 to 15 meters from major roadway.

Pb

Middle
Neighborhood,
Urban and regional

>2

1. Must be >20 meters from dripline of trees.
2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler.
3. Must have unrestricted airflow 270° around the sampler.
4. No furnace or incineration flues should be nearby.
5. Spacing from roads varies with traffic.

Separation distance between
roadways and stations, meters

Roadway average daily traffic vehicles per day	Micro scale	Middle scale	Neighborhood Urban Re- gional scale
<10,000	5-15	>15-50	>50
20,000	5-15	>15-75	>75
>40,000	5-15	>15-100	>100

TABLE 15

STATE OF MONTANA, AIR QUALITY BUREAU
AIR MONITORING NETWORK

Station	SAROAD	Site I.D.	Monitoring Objectives	Spatial Scale	New station to open	Target Date Existing station to close
I. <u>Total Suspended Particulates (TSP)</u>						
A. National Air Monitoring Stations (NAMS)						
Billings	Taft School	27 0080 062 F01	H,P,S	N		
	Taft School (co-located)	27 0080 062 F07	H,P,S	N		
Great Falls	Downtown	27 0660 017 G01	H,P	N		
	Downtown (co-located)	27 0660 017 G07	H,P	N		
Missoula	Courthouse Roof	27 1100 001 G01	H,P	N	1/85	
	Boyd Park	27 1100 024 G02	H,P	N	1/85	
	Boyd Park (co-located)	27 1100 024 G02	H,P	N	1/85	
B. State and Local Air Monitoring stations (SLAMS)						
Anaconda	Lincoln School	27 0020 007 F01	P	N		
	Highway Junction	27 0400 004 F02	S	N		
Billings	Sandstone School	27 0080 067 G01	P	N		
	City Hall	27 0080 008 G01	H,P	N		
	City Hall (co-1)	27 0080 028 G07	H,P	N		
	Grand Ave. Sch.	27 0080 009 G01	H,P	N		
	Lockwood Park	27 0080 065 F01	P,S	N		

Bozeman	East Main City Building	27 0120 002 F01	H,P	N	
	Whittier School Northeast Side	27 0120 005 F01	H,P H,P	N N	1/85 6/85
Butte	Greeley School	27 0160 005 F01	H,P,S	N	
	Greeley School (co-located)	27 0160 005 F07	H,P,S	N	1/85
Columbia Falls	Anders Residence	27 0270 005 F01	H,P	N	
East Helena	Hastie Residence	27 0860 002 F02	H,P,S	N	
	Hadfield	27 0860 719 F02	H,P,S	N	
	Hadfield (co-located)	27 0860 719 F07	H,P,S	N	
	South	27 0860 716 F02	S	N	
	Dartman Firehall	27 0860 722 F02	H,S	N	
Great Falls		27 0860 714 F02	H,P,S	N	
	Black Eagle P.O. Fire Station	27 0660 019 G01 27 0660 009 G01	H,P,S H,P	N N	
Helena	Cogswell Bldg. Capital Courts	27 0720 001 F01 27 0720 013 G05	P P	N N	
	Cooney Home	27 0720 016 G05	P	N	
	Universal Ath.	27 0800 015 F01	P	N	
Libby	Brown Residence	27 0900 010 F01	P,S	N	
	Courthouse Roof	27 0900 012 F01	H,P	N	
	Courthouse Roof (co-located)	27 0900 012 F07	H,P	N	6/85
Missoula	Rose Park	27 1100 020 G01	P	N	
Ovando	Terry Smith Ranch	27 1260 024 F03	B	R	

C. Special Purpose Monitors (SPM)

Deer Lodge	Powell Co.Cths.	27 0380 001 F01	P	N	
Dillon	Beaver.Co.Cths.	27 0420 001 F01	P	N	
Eureka	Lincoln Co.Cths.	27 0940 005 F01	P	N	
Glacier N.P.	St. Marys W. Glacier	27 0570 010 F02 27 0570 007 F02	B B	R R	
Glendive	Medical Arts Ctr.	27 0600 002 F01	P	N	6/85
Great Falls	Southeast		P	N	4/85
Hamilton	Courthouse	27 1300 001 F01	P	N	
Jeff. City	Corbin Flats		S,P	N	6/85
Kalispell	Courthouse	27 0800 017 F01	P	N	6/85
Laurel	Junior High	27 0840 001 G02	S,P	N	
Missoula	Hoerner-Waldorf #1	27 1100 015 G02	S	N	
	Hoerner-Waldorf #1 collocated	27 1100 015 G07	S	N	
	Hoerner-Waldorf #2	27 1100 016 G02	S	N	
	Rattlesnake East Missoula		H,P P	N N	6/85 6/85

Missoula	Meadow Hill Sch.	27	1100	029	G01	P	N	
	Spurgin Tower	27	1100	030	G01	P	N	
Montana City	School	27	0760	905	F05	P	N	
Sidney	Downtown	27	1320	010	F01	P	N	
Scobey	Border Station	27	0340	001	F03	S,B	R	6/85
	Richardson	27	0340	002	F03	B	R	6/85
	Hanrahan	27	0340	004	F03	B	R	6/85
Superior	Downtown					H,P	N	6/85
Thompson Falls	Courthouse	27	1400	003	F05	H,P	N	
II. <u>LEAD (Pb)</u>								
A. State and Local Air Monitoring Stations (SLAMS)								
Anaconda	Lincoln School	27	0020	007	F01	H,S,P	Mi	
	Highway Jct.	27	0400	004	F02			
East Helena	Hadfield	27	0860	719	F02	H,S,P	Mi	
	Hadfield	27	0860	719	F07	H,S,P	Mi	
	(co-located)							
	Hastie	27	0860	002	F02	H,S,P	M	
	Dartman	27	0860	722	F02	H,S	N	
	South	27	0860	716	F02	S	N	
	Firehall	27	0860	714	F02	H,S,P	Mi	
B. Special Purpose Monitors (SPM)								
Jeff. City	Corbin Flats					S,P	N	6/85
Montana City	School	27	0760	905	F05	P	N	

III. SULFUR DIOXIDE (SO2)

A. National Air Monitoring Stations (NAMS)

Billings Lockwood Park 27 0080 065 F01 S,P N

B. State and Local Air Monitoring stations (SLAMS)

Billings Coburn Road 27 0080 066 F01 S N
No. Johnson 27 0080 064 F01 S N
1/85

Scobey Border Sta. 27 0340 001 F03 S R
Hanrahan 27 0340 004 F03 S R
6/85.
6/85

IV. CARBON MONOXIDE (CO)

A. State and Local Air Monitoring stations (SLAMS)

Billings Fairgrounds 27 0080 061 F02 H,P,S M
6/85

70

Great Falls Pardis 27 0660 023 G02 H,P,S M

Missoula Boyd Park 27 1100 024 G02 P N

B. Special Purpose Monitors (SPM)

Missoula Residential P N
6/85

Billings Street Canyon 6/85

Helena Last Chance 6/85

Monitoring Objectives:

Spatial Scales:

H Highest Concentration	Mi Micro
P Population	M Middle
S source	N Neighborhood
B Background	U Urban
	R Regional

